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800 ADF (FIXED LOOP)

SERVICE PARTS MANUAL

800 ADF

AUTOMATIC DIRECTION FINDER

SYSTEM

TYPE 846A

SERVICE/PARTS MANUAL

This manual contains factory recommended procedures for servicing and maintaining the Cessna 800 ADF System, Type 846A. This manual is divided into six sections to provide the necessary information to assist in overhaul and replacement of parts of the Cessna 800 ADF System components.

This information is supplemented and kept current by Service Letters and Service News Letters published by the Cessna Aircraft Company. Recommended replacement parts for this system are available from the Cessna Dealers' Organization.

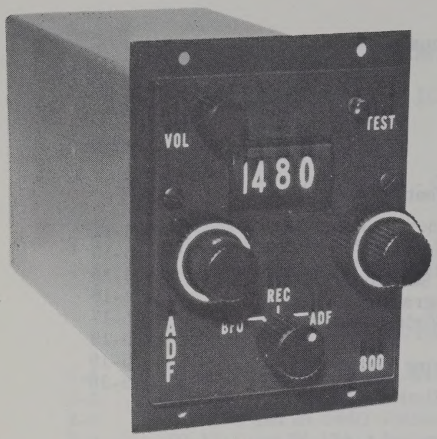
CESSNA AIRCRAFT COMPANY
WICHITA KANSAS
FEBRUARY 1973

D4506-13-RAND-500-2/73

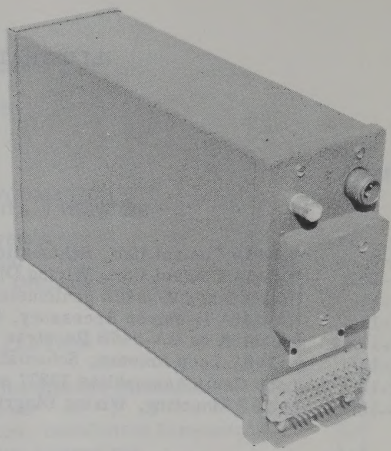
CONTENTS - Continued

ILLUSTRATIONS

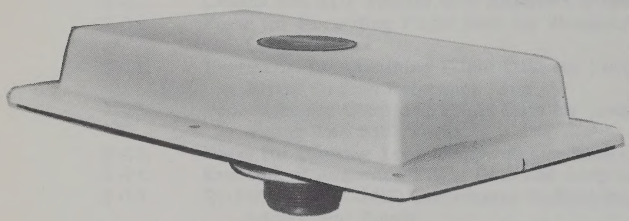
ILLUSTRATIONS - Continued



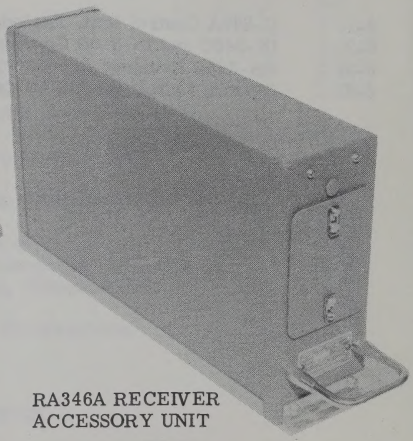
CONTROL UNIT (TYPE C-846A)



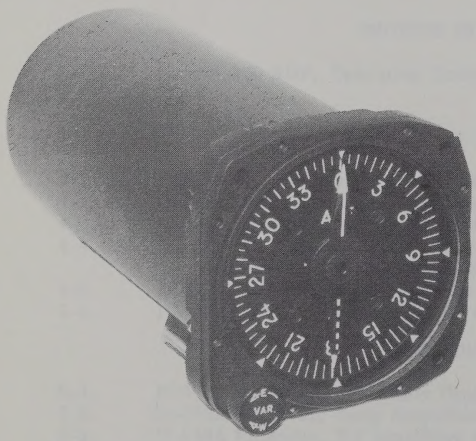
RECEIVER (TYPE R-846A)



LOOP ANTENNA
(TYPE 346A)



RA346A RECEIVER
ACCESSORY UNIT



GONIOMETER-INDICATOR
(TYPE IN-346C OR IN-346D)

IN12-1 INDICATOR

Figure 1-1. Cessna 800 Automatic Direction Finder System

SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION.

This instruction book provides installation, operation, maintenance, and replaceable parts information for the Cessna 800 Automatic Direction Finder (ADF) System, manufactured by Aircraft Radio Corporation, Boonton, New Jersey.

1-2. PURPOSE.

The Cessna 800 ADF System, shown in Figure 1-1, is an automatic direction finder system which provides continuous, visual bearing indications of the direction from which an RF signal is being received. It can be used for plotting position, for homing, and for aural reception of AM signals. In addition, a crystal-controlled, 1000-Hz beat frequency oscillator permits identification of stations transmitting CW signals. The frequency range of the ADF system is 200 kHz to 1, 699 kHz, with 1-kHz increments and a digital readout of the frequency selected. No mechanical bandswitching is required; the frequency range is electronically divided into 200-399 kHz, 400-799 kHz, and 800-1, 699 kHz.

1-3. SPECIFICATIONS.

Frequency Range: 200-1, 699 kHz

Frequency Increment: 1 kHz

Functions:
- ADF - Automatic direction finder using loop and sense antennas.
- REC - Communication receiver using only sense antenna.
- BFO - Identification of keyed CW signals.
- TEST - Verify reliability of indicated bearing.

Sensitivity:
- ADF - Less than 50 μV/m for maximum of 3 degrees bearing error.
- REC - Less than 50 μV/m for 6 dB S+N/N output ratio with 1000 Hz, 30% modulated signal on all bands.
- BFO - Less than 50 μV/m for 6 dB S+N/N output ratio on all bands.

Selectivity: 6 dB bandwidth, 4 kHz maximum, 65 dB bandwidth, 12 kHz maximum.

Image Rejection:
- $\geqslant$80 dB up to 415 kHz
- $\geqslant$70 dB from 415 kHz to 800 kHz
- $\geqslant$55 dB above 800 kHz

Audio Output: 100 mW into 500Ω.

$\geqslant$ greater than or equal to

Input Power: 1.3 A maximum at 28 V dc.

Dimensions: See Figures 2-1 through 2-7.

Weights: See Figures 2-1 through 2-7.

Certification:

TSO C-41B, Class A, Env. Category:

R-846A	$\frac{A}{D}$AAAAAX
M-846A	$\frac{A}{D}$AAAAAX
C-846A	$\frac{A}{D}$ACAAAX
L-346A	AAAAAAE
IN-346 ()	DACAAAX
RA-346( )	AAAAAAX

1-4. UNITS AND ACCESSORIES.

The units and accessories available for the Cessna 800 ADF installation are listed in Table 1-1.

1-5. DESCRIPTION OF UNITS.

Receiver. The R-846A Receiver is a superheterodyne receiver with a frequency range of 200 to 1, 699 kHz, electronically divided into the following three bands: 200-399 kHz, 400-799 kHz, and 800-1, 699 kHz. When a frequency is selected on the C-846A Control Unit, bandswitching and receiver tuning are automatic. For the automatic direction finding (ADF) mode of operation, the receiver uses the sense antenna and the loop antenna for reception. For the other modes of operation (REC and BFO), the receiver uses only the sense antenna.

The receiver consists of seven plug-in, printed circuit module assemblies and one "mother board" (chassis) printed circuit assembly, identified as follows: Loop Amplifier Assembly A1, RF Assembly A2, IF Assembly A3, Servo Assembly A4, Phase Detector Assembly A5, N Divider Assembly A6, VCO Assembly A7, and Chassis Assembly A8.

No mechanically-operated, ganged, tuning capacitors are used. Instead, all LC circuits involved in tuning

TABLE 1-1. UNITS AND ACCESSORIES

Name	Type No.	Part No.
Receiver	R-846A	40200-0000
Mounting (for R-846A)	M-846A	40830-0000
Control Unit	C-846A	40220-1000
Goniometer-Indicator	IN-346C*	41360-1000
	IN-346D*	41360-1100
Loop Antenna	L-346A	41000-1000
Receiver Accessory (for single ADF)	RA-346A+	41340-0001
Receiver Accessory (for dual ADF)	RA-346B+	41340-0002
Indicator (single-pointer)	IN-12-1+	27310-0000
Indicator (dual-pointer)	IN-13A-1+	27470-0000
Connector (for R-856A)	--	38423-0045
Connector (for C-846A)	--	38423-0042
Connector (for IN-346 ( ) or RA-446A)	--	38423-0040
Connector (for IN-12-1)+	--	14491-0000
Sense Antenna Cable Assembly (7 feet)*	--	17984-0000
(14 feet)*	--	18637-0000
Loop Cable Assembly (9 feet)*	--	33827-0000
(20 feet)*	--	32803-0000
Goniometer Cable Assembly (10 feet)*	--	41606-0010 +41277-0010
(20 feet)*	--	41606-0020 +41277-0020
(30 feet)*	--	41606-0030 +41277-0030
Doubler Plate (for L-346A)+	--	33237-0000
RF Signal Limiter +	--	41376-0000
Sense Antenna Kit +	--	19210-0000

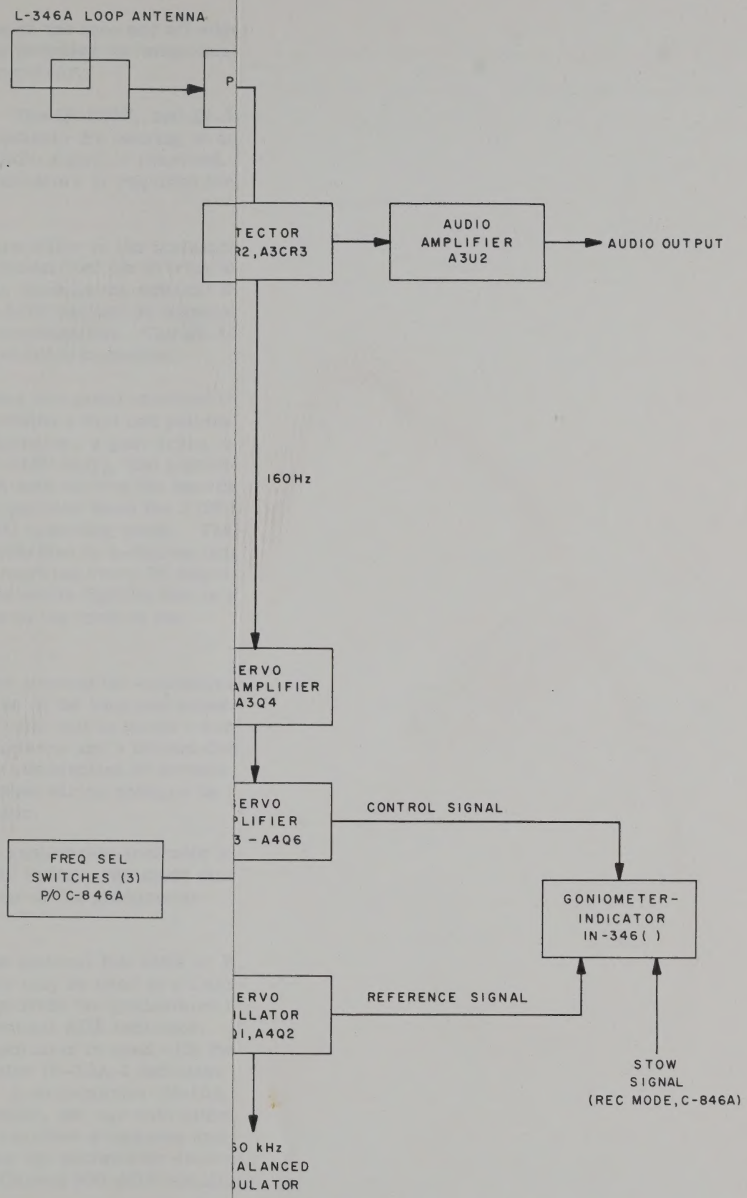
*Alternative items; supplied as specified.
+Optional.

the receiver to a particular frequency use variable-capacitance silicon diodes (varactors). The tuning voltages for the diodes are generated in the digital, frequency-controlled circuitry.

The R-846A may be installed in a remote location on the M-846A Mounting. Connections to the receiver are made through three connectors on the front of the unit.

Control Unit. The C-846A Control Unit is used for remote-control operation of the ADF System. A combined on-off rotary switch and potentiometer control the primary power to the set and the audio output level (volume) of the receiver. Three knobs select the receiver operating frequency, which is displayed digitally. Operating modes (ADF, REC, BFO) are selected by a rotary switch. A momentary-on switch (TEST) is used to check the signal reliability in the ADF mode. All operating controls are located on the front panel. Six subminiature lamps are used for edge-lighted illumination of the frequency indicator and the control markings. Electrical connections to the control unit are made through a connector on the rear of the unit.

Loop Antenna. The L-346A Loop Antenna consists of two insulated coils wound at right angles to each other on a flat ferrite core. The nonsymmetry of the coil windings provides a fixed compensation of 7.5 degrees in the loop antenna, and the high permeability of the ferrite core concentrates the RF field in the coils so that the sensitivity of the L-346A Loop Antenna is equal to that of an air-core loop many times larger. The L-346A is designed for mounting on the exterior surface of the aircraft. The coils and ferrite core are encapsulated in plastic foam and housed in a hard plastic shell. An arrowhead, impressed in the plastic shell, indicates the forward direction for mounting purposes; the centerline of the antenna is



) ADF, Functional Block Diagram

TABLE 1-1. UNITS AND ACCESSORIES

Name	Type No.	Part No.	
Receiver	R-846A	40200-0000	
Mounting (for R-846A)	M-846A	40830-0000	
Control Unit	C-846A	40220-1000	
Goniometer-Indicator	IN-346C*	41360-1000	
	IN-346D*	41360-1100	
Loop Antenna	L-346A	41000-1000	
Receiver Accessory (for single ADF)	RA-346A+	41340-0001	
Receiver Accessory (for dual ADF)	RA-346B+	41340-0002	
Indicator (single-pointer)	IN-12-1+	27310-0000	
Indicator (dual-pointer)	IN-13A-1+	27470-0000	
Connector (for R-856A)	--	38423-0045	
Connector (for C-846A)	--	38423-0042	
Connector (for IN-346 ( ) or RA-446A)	--	38423-0040	
Connector (for IN-12-1)+	--	14491-0000	
Sense Antenna Cable Assembly (7 feet)*	--	17984-0000	
(14 feet)*	--	18637-0000	
Loop Cable Assembly (9 feet)*	--	33827-0000	
(20 feet)*	--	32803-0000	
Goniometer Cable Assembly (10 feet)*	--	41606-0010	+41277-0010
(20 feet)*	--	41606-0020	+41277-0020
(30 feet)*	--	41606-0030	+41277-0030
Doubler Plate (for L-346A)+	--	33237-0000	
RF Signal Limiter +	--	41376-0000	
Sense Antenna Kit +	--	19210-0000	

*Alternative items; supplied as specified.
+Optional.

the receiver to a particular frequency use variable-capacitance silicon diodes (varactors). The tuning voltages for the diodes are generated in the digital, frequency-controlled circuitry.

The R-846A may be installed in a remote location on the M-846A Mounting. Connections to the receiver are made through three connectors on the front of the unit.

Control Unit. The C-846A Control Unit is used for remote-control operation of the ADF System. A combined on-off rotary switch and potentiometer control the primary power to the set and the audio output level (volume) of the receiver. Three knobs select the receiver operating frequency, which is displayed digitally. Operating modes (ADF, REC, BFO) are selected by a rotary switch. A momentary-on switch (TEST) is used to check the signal reliability in the ADF mode. All operating controls are located on the front panel. Six subminiature lamps are used for edge-lighted illumination of the frequency indicator and the control markings. Electrical connections to the control unit are made through a connector on the rear of the unit.

Loop Antenna. The L-346A Loop Antenna consists of two insulated coils wound at right angles to each other on a flat ferrite core. The nonsymmetry of the coil windings provides a fixed compensation of 7.5 degrees in the loop antenna, and the high permeability of the ferrite core concentrates the RF field in the coils so that the sensitivity of the L-346A Loop Antenna is equal to that of an air-core loop many times larger. The L-346A is designed for mounting on the exterior surface of the aircraft. The coils and ferrite core are encapsulated in plastic foam and housed in a hard plastic shell. An arrowhead, impressed in the plastic shell, indicates the forward direction for mounting purposes; the centerline of the antenna is

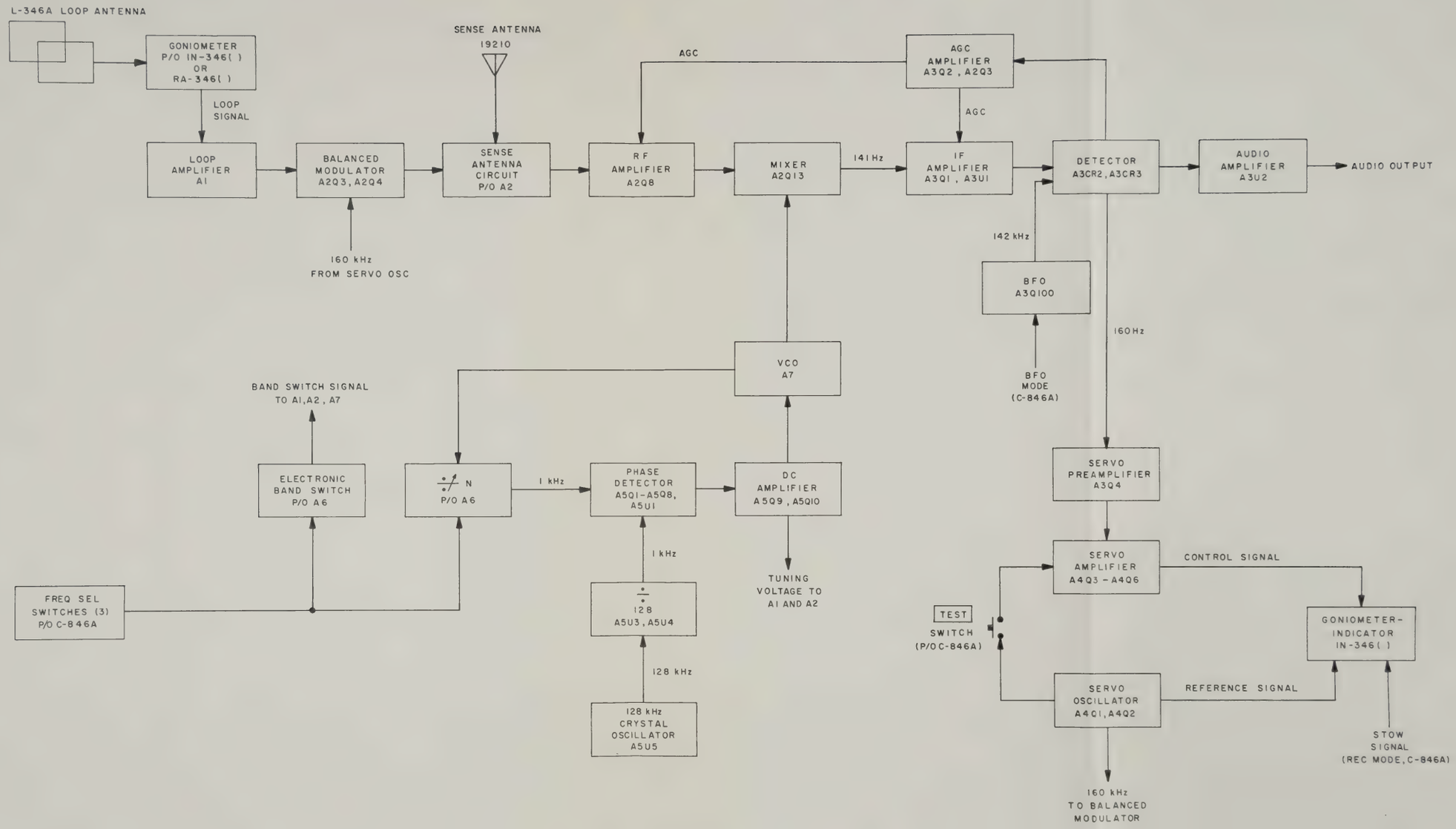


Figure 1-2. Cessna 800 ADF, Functional Block Diagram

indicated by index marks on the fore and aft edges. A seven-pin connector is provided for interconnecting the antenna and the receiver.

Goniometer-Indicators. The IN-346C, and IN-346D Goniometer-Indicators indicate the bearing of the source from which the radio signal is received. Only one of the goniometer-indicators is required for an ADF installation.

The goniometer-indicators differ in the inclusion or exclusion of a synchro transmitter for driving an additional ADF indicator, such as the optional IN-12-1. The IN-346C and IN-346D include an adjustable device for mechanical compensation. The IN-346D include the additional synchro transmitter.

The goniometer-indicators are panel-mounted instruments, each of which contains a dial and pointer assembly, a motor, a goniometer, a gear train, a synchro transmitter (IN-346D only), and a pointer-stow switch. The switch acts to stow the bearing pointer at the 90-degree position when the ADF System is in the REC or BFO operating mode. The dial of each instrument is calibrated in 5-degree increments with a numerical marking every 30 degrees. It is illuminated with blue-white lighting and is rotatable by a knob located on the front of the goniometer-indicator.

The internal wiring of the goniometer-indicators is determined by the location of the loop and sense antennas on the aircraft. Each unit is factory-wired for a top-located sense antenna and a bottom-located loop antenna. Any other combination of antenna locations requires that simple wiring changes be made in the goniometer-indicator.

Connections between the goniometer-indicator and the other units of the ADF System are made through two connectors on the rear of the goniometer-indicator.

Receiver Accessory. An optional RA-346A or RA-346B Receiver Accessory may be used in a Cessna 800 ADF installation to provide the goniometer function for driving a conventional ADF indicator. A single-pointer IN-12-1 indicator is used with the RA-346A and a dual-pointer IN-13A-1 indicator is used with the RA-346B. A dual-pointer IN-16A RMI is available on special order, for use with either receiver accessory. The receiver accessory and the selected indicator replace the goniometer-indicator normally supplied for a Cessna 800 ADF installation.

The RA-346A and the RA-346B are identical in appearance and function, but differ in the number of electromechanical assemblies in each unit. The RA-346B, which is used in a dual ADF installation, includes two electromechanical assemblies, while the RA-346A, which is used in a single ADF installation, includes only one. Each electromechanical assembly consists of a motor, goniometer, synchro transmitter, and compensating mechanism. The internal wiring of each assembly is determined by the location of the ADF loop and sense antennas.

The assemblies are factory-wired for a top sense antenna and a bottom loop antenna installation. For any other combination of antenna locations, the wiring must be changed. These wiring changes should be made before the unit is installed.

No operating controls or indicators are included in the receiver accessory unit. Electrical connections to the other units of the set are made through connectors which mate with the cable assemblies supplied, and a connector on the rear of the unit which mates with the connector on the 41350 Mounting. (Type M-59B)

Mountings. The M-846A Mounting is made of aluminum alloy and is used to shock-mount the receiver. An adjustable flange, on the front of the mounting, secures the receiver to the mounting base. Flexible metal straps on the underside of the mounting are used to ground the receiver and mounting to the airframe.

The M-59B Mounting is used to shock-mount the RA-346A or RA-346B Receiver Accessory. An adjustable flange, on the front of the mounting, secures the unit to the mounting base. Flexible metal straps on the underside of the mounting are used to ground the receiver accessory and mounting to the airframe. The mounting provides electrical connections between the receiver and both the receiver and indicator.

Cable Assemblies. A loop cable assembly, a sense antenna cable assembly, and a goniometer cable assembly are supplied. Different lengths of cable assemblies are available; the lengths are critical and must be used as supplied.

The loop cable assembly is used to connect the loop antenna to the goniometer-indicator or the receiver accessory. The cable assembly is normally supplied in a 20-foot length. A 9-foot length is available as an option. To compensate for the difference in length, the 9-foot cable includes two 75-pF capacitors to equal the capacity of the 20-foot length.

The sense antenna cable assembly is used to connect the sense antenna to the receiver. It is normally supplied 7 feet long. A 14-foot length is available as an option. The 7-foot cable uses RG-62/U coaxial cable while the 14-foot length uses RG-114A/U coaxial cable so that either cable assembly has a capacity of 100 pF.

The goniometer cable assembly, available in a 10-, 20-, or 30-foot length, unterminated at one end, is supplied for connecting the goniometer-indicator or receiver accessory to the receiver.

An open wire cable assembly is required but not supplied for completing all other connections from the receiver to the goniometer-indicator or receiver accessory, and for connecting the receiver with the aircraft's power and audio circuits. The cable harness assembly is fabricated using individual wires (not supplied) and the connectors listed in Table 1-1.

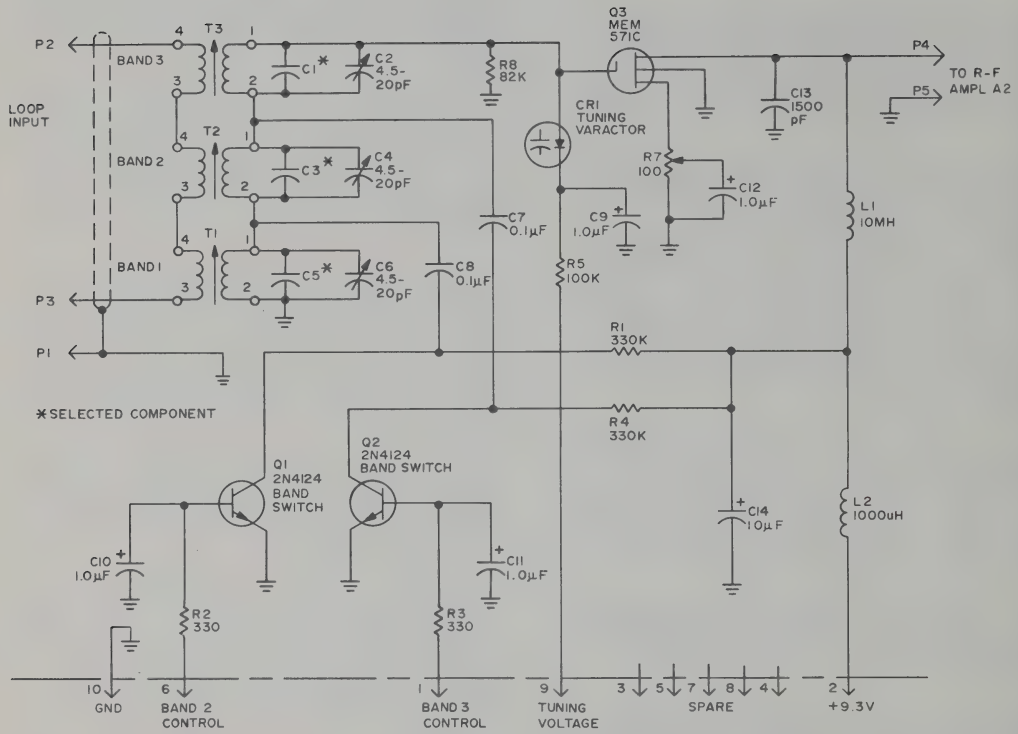


Figure 1-3. A1, Loop Amplifier, Simplified Schematic Diagram

Accessories. Doubler plate, Part No. 33237-0000, may be used to facilitate the installation of the loop antenna. When secured to the aircraft skin, it allows the loop antenna to be removed and reinstalled easily. The doubler plate also acts as a stress distributor, minimizing the stress on the aircraft skin at each mounting point.

Sense Antenna Kit, Part No. 19210-0000, includes all the parts necessary for constructing and installing a sense antenna. Although a custom sense may be fabricated, use of the kit is recommended. Insulator Assembly, Part No. 19077, is supplied with the sense antenna kit and may also be supplied individually. The insulator assembly is used for coupling the sense antenna to the sense antenna cable assembly. It is desirable that this insulator assembly, or its equivalent, be used to retain the electrical characteristics of the sense antenna cable assembly.

RF Signal Limiter, Part No. 42376-0000, is used to eliminate interference from transmitter signals which may be picked up by the sense antenna. It is connected between the sense antenna cable and the receiver. The limiter includes six 1N3604 diodes to eliminate interference from VHF communication equipment and a low-pass filter to eliminate interference from DME and transponder equipment. The parts are encapsulated within a rigid body consisting of a female connector at one end and a male connector at the other end joined by an intermediate spacer. The limiter does not affect the performance of the receiver.

1-6. FUNCTIONAL DESCRIPTION.

General. The Cessna 800 ADF System provides navigation bearings on any continuous radio signal between 200 kHz and 1, 699 kHz. It can also be used as a communication receiver and for identification of keyed CW signals. A functional block diagram is shown in Figure 1-2.

Frequency Selection. The frequency range of the R-846A Receiver is divided into three bands: 200-399 kHz, 400-799 kHz, and 800-1, 699 kHz. When a frequency is selected, the required band is automatically selected.

As shown in the schematic diagram, Figure 5-1, the loop amplifier, sense antenna, RF Amplifier, mixer, and voltage-controlled oscillator (VCO) circuits include a separate resonant circuit for each operating band. These circuits consist of the secondary winding of an RF transformer or an RF coil and a trimmer capacitor which are electronically tuned to the selected frequency by a varactor (variable-capacitance diode). A tuning voltage developed in the phase detector supplies the appropriate dc reverse bias voltage to vary the capacitance of the varactor.

The secondary winding of the RF transformers used in the loop and RF amplifier circuits and the coils used in the mixer and VCO circuits are connected in series. In each circuit, for Band 1 operation, all windings are used to provide maximum inductance. For Band 2, the secondary winding of one RF transformer, or the winding of one coil, is effectively removed by shorting it electronically to ground through a capacitor, reducing the total inductance. For Band 3, the secondary windings of two RF transformers, or the windings of two coils, are effectively removed by shorting each winding to ground through a capacitor, reducing the total inductance still more. In each case, the grounding or ungrounding of the capacitors is effected by turning a transistor on or off by a logic line from the frequency determining circuits.

As an example, in the loop circuit shown in Figure 1-3, for Band 1 operation, A1Q1 and A1Q2 are turned off; that is, they will not operate since no operating voltage is applied by the logic line. Under this condition, A1C7 and A1C8 are effectively disconnected from ground and maximum inductance (all secondary windings of A1T1, A1T2, and A1T3) is provided. For Band 2 operation, only A1Q1 is turned on, which connects A1C8 to ground and effectively removes the secondary winding of A1T1 from the circuit. For Band 3 operation, both A1Q1 and A1Q2 are turned on, grounding both A1C7 and A1C8. This effectively removes the secondary windings of A1T1 and A1T2 from the circuit, so that only the secondary of A1T3 provides the inductance.

In the sense antenna circuit, to obtain the inductances required, switching diodes A2CR3 and A3CR4 are used to connect A2L3 and A2L4, as required, in parallel with the sense antenna input coil, A2L1. Also, diodes A2CR1 and A2CR2 are used to connect the tuned-circuit coils, A2L5 and A2L6, as required, in parallel with the secondary winding of coupling transformer A2T1. The diodes are switched in or out of the circuit by transistors A2Q6 and A2Q7, which are turned on or off by logic lines.

For Band 1 operation, A2Q6 and A2Q7 are turned off (no base voltage), which opens all four switching diodes to provide the maximum inductance of A2L1 and the maximum inductance of the secondary winding of A2T1. Also A2Q5 is turned on, which connects A2C12 across the winding of A2T1 for trimming at the high end of Band 1.

For Band 2 operation, only A2Q6 is turned on, A2CR1 then conducts and parallels A2L5 with the secondary of A2T1; A2CR3 conducts, and parallels A2L3 with A2L1. Also, A2Q5 is turned off, which removes A2C12 and allows Band 2 to be trimmed with its own trimmer capacitor, A2C18.

For Band 3 operation, A2Q6 is turned off and A2Q7 is turned on. A2CR2 then conducts, connecting A2L6 in parallel with the secondary of A2T1, and A2CR4 conducts, connecting A2L4 in parallel with A2L1.

The receiver operating frequency is selected by three switches in increments of 100 kHz, 10 kHz, and 1 kHz. The switch positions determine the open or grounded condition of logic lines applied to the N divider module of the frequency determining circuit. The N divider also receives an input from the voltage-

controlled oscillator and reduces this signal to a 1-kHz signal which is applied to the phase detector. The phase detector also receives a 1-kHz signal supplied by 128-kHz crystal oscillator A5U5 through 128-divider A5U3 and A5U4. These two signals are compared in the phase detector to produce a dc error voltage which is amplified in dc amplifier A4Q5 and A5Q10 and applied to the voltage-controlled oscillator to determine the frequency of the signal supplied to mixer A2A13. A tuning voltage supplied by the phase detector is also applied to the loop amplifier, sense antenna circuit, RF amplifier, and mixer.

Automatic Direction Finder Operation. When ADF operation is selected, signals received by both the sense antenna and the loop antenna are used in the receiver. The RF signal from the loop antenna, which is 90° out of phase with the signal from the sense antenna, is connected directly to the stator windings of the goniometer in the goniometer-indicator or the receiver accessory. An RF field developed in the stator winding induces a voltage into the goniometer rotary winding. This induced voltage is proportional to the difference between the bearing represented by the angular position of the rotor and the bearing of the received signal. The difference voltage, supplied as a loop input signal to the receiver, is amplified in loop amplifier A1, where its phase is shifted 90°. The resulting output from A1 is an amplified RF difference signal that is either in phase or 180° out of phase with the sense antenna signal. This difference signal is applied to balanced modulator A2Q3 and A2Q4.

A 160-Hz modulating voltage, in opposite phase, is also supplied to each half of the balanced modulator from the servo oscillator, A4Q1 and A4Q2, and is combined with the difference signal from A1. The output signal from the balanced modulator is applied to the sense antenna circuit in A2 and is added to or subtracted from the induced sense antenna signal. The addition or subtraction is determined by the phase relationship between the loop amplifier output signal and the sense antenna signal.

The output from the sense antenna circuit is amplified in A2Q8 and applied to mixer A2Q13. The mixer also receives an input signal from the voltage-controlled oscillator. The mixer produces an IF output signal of 141 kHz, which is amplified in A3Q1 and A3U1 before it is applied to detectors A3CR2 and A3CR3. The audio modulation portion of the IF signal is detected and applied to audio amplifier A3U2 for amplification and application to the aircraft audio circuits. A portion of the detected signal is returned through AGC amplifier A3Q2 and A3Q3 to control the RF and IF amplifiers.

A 160-Hz signal from the detector is applied to servo preamplifier A3Q4 for amplification. The output of A3Q4 is filtered and amplified further by servo power amplifier A4Q3-A4Q6; it is then applied to the control winding of the servo motor in the goniometer-indicator or receiver accessory. A 160-Hz reference voltage is provided to the servo motor from servo oscillator A4Q1, A4Q2, since the fixed phase winding of the servo oscillator is a portion of the 160-Hz frequency-determining circuits. The direction in which the shaft of the servo motor rotates is dependent upon the phase relationship between the 160-Hz reference voltage and the 160-Hz voltage applied to the control winding. Since the shaft of the servo motor is mechanically linked to the rotor of the goniometer, any rotation of the servo motor shaft will cause a similar rotation of the goniometer rotor. The phase of the voltage applied to the control winding of the servo motor will be such as to cause the motor to rotate in a direction that will reduce the difference between the angular position of the goniometer rotor and the direction of the received RF signal. When this difference is reduced to zero, the servo motor will stop. The pointer on the goniometer-indicator will then indicate the bearing of the station being received.

A TEST switch on the C-846A allows momentary injection of the 160-Hz signal from the servo oscillator directly into the servo amplifier. This 160-Hz signal slews the goniometer and causes the pointer to rotate away from the bearing of the signal being received. When the TEST switch is released, the goniometer and the pointer will return to the bearing of the received signal, provided the intensity of the received signal is sufficient for a usable bearing indication and the set is operating normally.

Communication Receiver Operation. In the REC mode of operation, operating power is removed from loop amplifier A1 and balanced modulator A2Q3. Also, the pointer of the goniometer-indicator is stowed at 90° as an indication that the ADF mode is not functioning. Only the sense antenna is used, and the RF voltage induced in the sense antenna is processed through the receiver in the same manner as for ADF operation.

For the 90-degree pointer storage, primary power is applied to the fixed phase of the servo motor through the contacts of the pointer-stow switch in the goniometer-indicator. The 160-Hz signal is fed to the control winding and the pointer slews until it reaches the 90-degree position, at which time primary power is removed from the motor and the pointer remains at the 90-degree position.

Keyed CW Signal Reception. When BFO operation is selected, a 142-kHz output from beat-frequency-oscillator A3Q100 is injected into the tuned input circuit of detector A3CR2 and A3CR3. This output beats with the amplified IF signal to produce a 1000-Hz tone which is used for identification of keyed CW signals. All other circuit operation is identical to the REC mode.

SECTION II

INSTALLATION

2-1. UNPACKING.

Carefully remove the equipment from the packing case. Inspect each item for damage. Be sure the operating controls on the control unit function properly. Check the units and accessories against the packing slip to be sure all items have been received and removed from the packing case.

2-2. INSTALLATION CONSIDERATIONS.

The location and installation of the units will depend on the type of aircraft in which the equipment is to be installed; however, the following requirements are applicable to all types of aircraft.

Unit Dimensions and Installation Area. Installation and outline dimensions are shown in Figures 2-1 through 2-7. Compare the space requirements of each unit with the area being considered. Locate the units so that they are accessible for inspection and maintenance and in an area free from excessive vibration and heat.

Location of Receiver. The receiver may be installed remotely in any convenient location, limited only by the length of the connecting cables. Allow sufficient clearance at the rear for cable and external wiring connections to be made. Also, allow sufficient clearance on all sides of the unit for shock-mount travel.

Location of Control Unit. Install the control unit within convenient view and reach of the operator. Allow sufficient clearance at the rear for cable connections to be made.

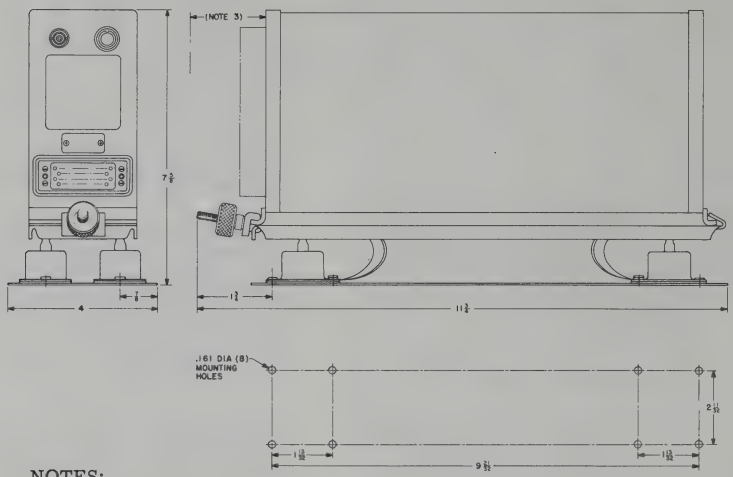
Location of Goniometer-Indicator. The goniometer-indicator should be installed within convenient view and reach of the operator. Allow at least 3 inches of open space at the rear of the unit for installing the two connectors. Because the lengths of the interconnecting cables are critical and cannot be altered, the distances between the goniometer-indicator and the receiver and loop antenna must not exceed the cable lengths ordered for the specific installation.

Location of Loop Antenna. The loop antenna may be mounted on either the top or bottom of the aircraft, but should be located as near as possible to the centerline of the aircraft. The loop antenna should be kept away from other antennas and structural members which may cause distortion of the radio field pattern. Because the length of the loop cable is critical and cannot be altered, the distance between the loop antenna and the goniometer-indicator must not exceed the cable length of 9 feet for Loop Cable 33827 or 20 feet for Loop Cable 32803.

Location of Receiver Accessory. The receiver-accessory may be installed in any convenient location. Because the lengths of the interconnecting cables are critical and cannot be altered, the distance between the receiver and the receiver accessory must not exceed 30 feet, and the distance between the loop antenna and the receiver accessory must not exceed 20 feet.

Characteristics of Sense Antenna. It is difficult to obtain optimum antenna arrangements on any but the largest aircraft; even then certain compromises are to be expected. An ADF usually performs satisfactorily using a "standard" range antenna. A satisfactory type of wire antenna is the balanced-T or symmetrical-T, although an inverted-L or unbalanced-T may also provide acceptable results. However, the balanced-T antenna is preferred because it is not responsive to horizontally polarized transmissions. (Response to horizontal radiation is undesirable where accurate indications of overstation position are required.) The sense antenna may be mounted on either the top or bottom of the aircraft, but should be located as near the centerline as possible. The flat-top portion of the antenna should not be less than 8 feet in length. A length up to 12 feet may give increased performance. A longer sense antenna will provide better communication receiver sensitivity, but may result in sluggish ADF operation. The average clearance between the antenna and the skin of the aircraft should be 10 inches or more. Sense Antenna Kit 19210 includes all of the parts necessary for constructing and installing a sense antenna.

Depending on the location of the sense antenna, the feed-through insulator for the sense antenna should be mounted on either the top or bottom of the aircraft, as near as possible to the midpoint of the aircraft. The sense antenna cable is supplied in either a 7- or 14-foot length. (Where extremely short runs are encountered, it may be more convenient to fabricate a 3-1/2-foot section of RG-58/U cable locally, although no performance advantage would result.) Each of the sense antenna cables has a capacitance of 100 pF. To maintain proper antenna tuning, the lengths of these cables must not be altered. The 7-foot cable is preferred because of its lighter weight, flexibility, and ruggedness.



NOTES:

1. DIMENSIONS ARE IN INCHES.
2. WEIGHT (INCLUDING MOUNTING): 4.4 POUNDS.
3. ALLOW 3 INCHES FOR PLUG REMOVAL.

Figure 2-1. R-846A Receiver with M-846A Mounting, Installation Dimensions

2-3. INSTALLATION OF RECEIVER AND MOUNTING.

To install the receiver and mounting, proceed as follows:

Step 1. Drill aircraft mounting surface for eight No. 8-32 screws, located as shown in Figure 2-1. Remove paint and clean the surface around the holes to ensure proper bonding.

NOTE

Mounting may be used as template for locating mounting holes.

Step 2. Place mounting in place and secure with eight binding head screws, lockwashers, and nuts.

Step 3. Loosen flange thumbnut on front of mounting. Slide receiver onto mounting until the bracket at the back of the unit engages the angle of the mounting.

Step 4. Position angle flange on receiver and tighten thumbnut.

2-4. INSTALLATION OF CONTROL UNIT.

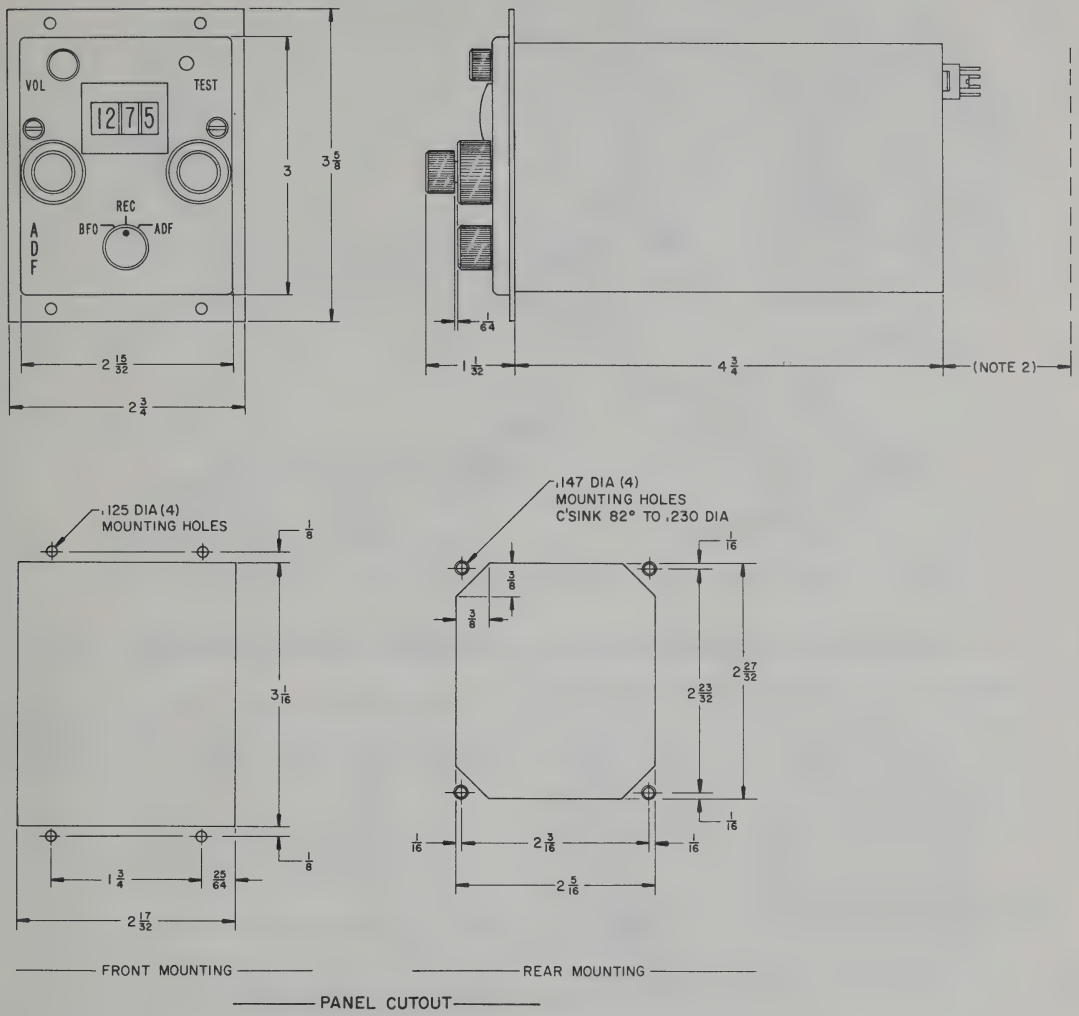
The C-846A should be installed within convenient view and reach of the operator. The rear-mount cutout, shown in Figure 2-2, is used for mounting the unit directly on a 1/16-inch thick panel. If the panel is of any other thickness, use the front-mount cutout, also shown in Figure 2-2, and install the unit with the adapter plate supplied.

2-5. INSTALLATION OF GONIOMETER-INDICATOR.

Installation dimensions for the IN-346C and IN-346D are shown in Figure 2-3. As supplied, the goniometer-indicator is wired for a bottom-mounted loop antenna and top-mounted sense antenna. Before installing the goniometer-indicator, note the proposed installation locations of the loop and sense antennas, then check the internal wiring connections of the goniometer-indicator for agreement with the antenna locations (see Figure 2-8). Install the goniometer-indicator on a shock-mounted instrument panel with suitable hardware.

NOTE

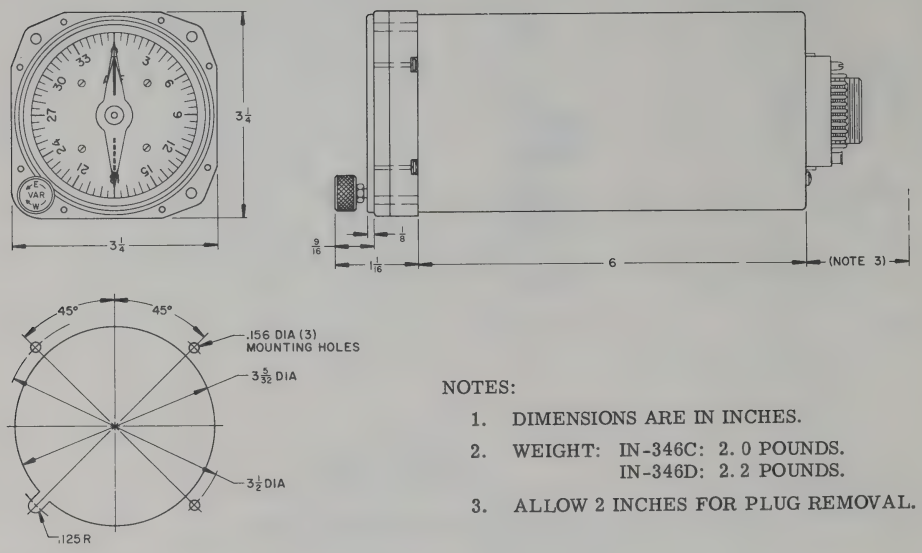
The goniometer-indicator must be installed within 10, 20, or 30 feet of the receiver, depending on the length of the cable assembly supplied.



NOTES:

1. DIMENSIONS ARE IN INCHES.
2. ALLOW 3 INCHES FOR PLUG REMOVAL.
3. WEIGHT: 1.3 POUNDS.

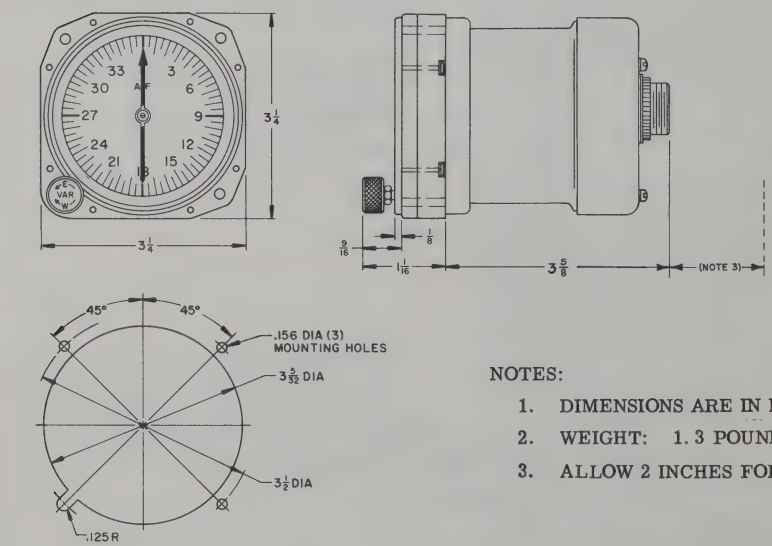
Figure 2-2. C-846A Control Unit, Installation Dimensions



NOTES:

1. DIMENSIONS ARE IN INCHES.
2. WEIGHT: IN-346C: 2.0 POUNDS.
   IN-346D: 2.2 POUNDS.
3. ALLOW 2 INCHES FOR PLUG REMOVAL.

Figure 2-3. IN-346C and IN-346D Goniometer-Indicators, Installation Dimensions



NOTES:

1. DIMENSIONS ARE IN INCHES.
2. WEIGHT: 1.3 POUNDS.
3. ALLOW 2 INCHES FOR PLUG REMOVAL.

Figure 2-4. IN-12-1 and IN-13A Indicator, Installation Dimensions

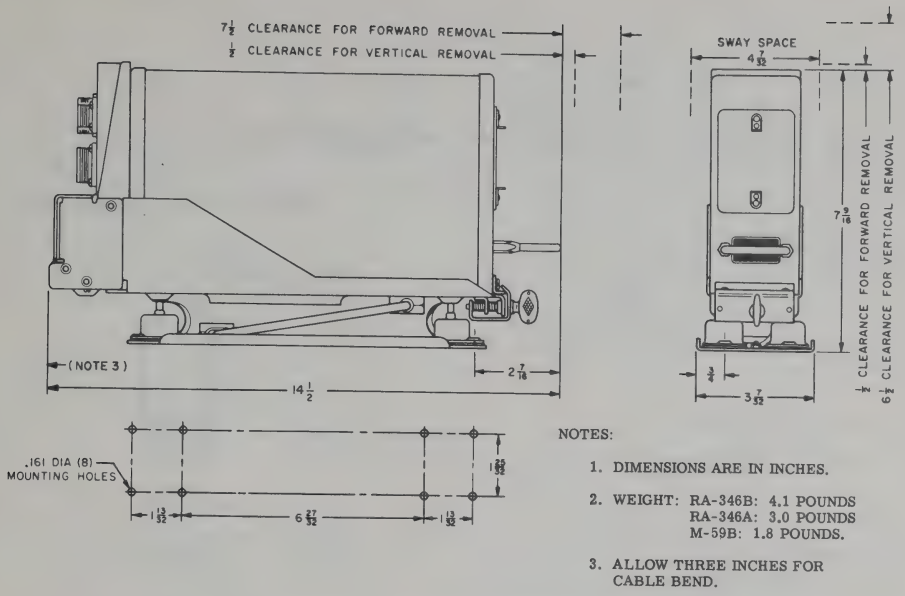


Figure 2-5. RA-346 ( ) Receiver Accessory with M-59B Mounting Installation Dimensions

2-6. INSTALLATION OF RECEIVER ACCESSORY AND MOUNTING.

To install the receiver accessory and mounting, proceed as follows:

Step 1. Drill aircraft mounting surface for eight No. 8-32 screws, located as shown in Figure 2-5.

NOTE

Mounting may be used as template for locating mounting holes.

Step 2. Place mounting in place and secure with suitable hardware.

Step 3. Note the proposed installation locations of the loop and sense antennas, then check the internal wiring connections fo the receiver accessory for agreement with the antenna locations (see Figure 5-13). (As supplied, the receiver accessory is wired for a bottom-mounted loop antenna and a top-mounted sense antenna.)

Step 4. Loosen flange thumbnut on front of mounting. Slide receiver accessory onto mounting until connectors are fully mated.

Step 5. Position flange on receiver accessory and tighten thumbnut.

2-7. INSTALLATION OF SENSE ANTENNA.

The sense antenna may be fabricated from optional Sense Antenna Kit 19210. General installation requirements are discussed in paragraph 2-2 and are shown in Figure 2-6. The procedure for installing the insulator assembly, which may be ordered as a separate item, is outlined in paragraph 2-8.

2-8. INSTALLATION OF INSULATOR ASSEMBLY.

To install Insulator Assembly 19077 (see Detail C of Figure 2-6), proceed as follows:

Step 1. If necessary, place a doubler plate at feed-through location to provide a total thickness of at least 0. 040 inch.

Step 2. Drill a 3/8-inch hole through doubler plate and aircraft skin.

Step 3. Mount connector in hole using formed washer and hexagon nut.

Step 4. Slide cap over antenna lead-in. Place lead-in through cross-hole in terminal of connector, and solder so that lead-in is aligned with center of connector.

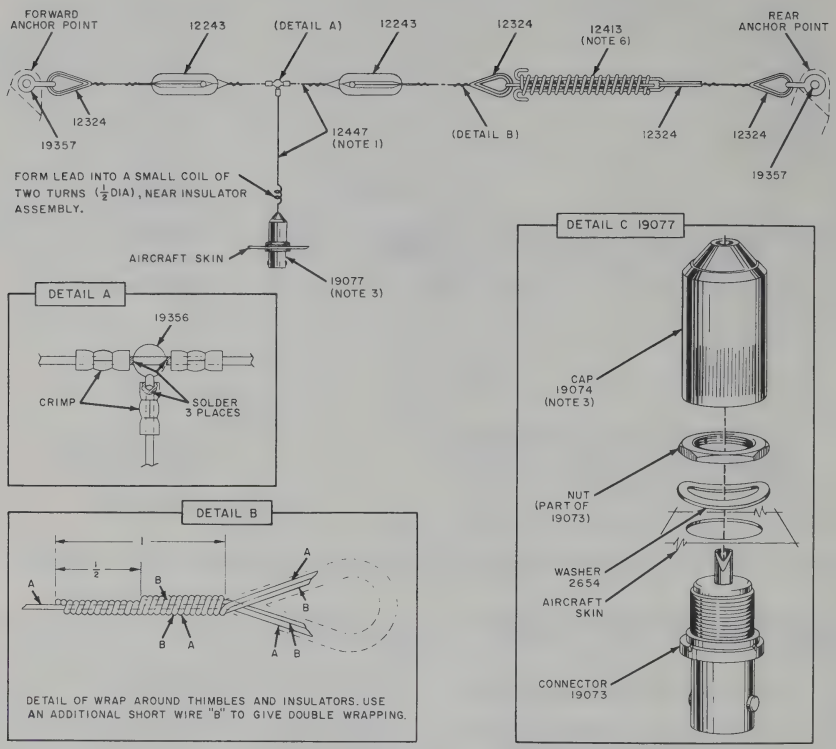
Step 5. Cut off excess lead-in wire. Screw cap assembly on connector.

2-9. INSTALLATION OF LOOP ANTENNA.

Installation dimensions for the L-346A Loop Antenna are shown in Figure 2-7. To obtain maximum advantage of the 7. 5° of fixed compensation in the loop antenna, the final position of the loop should not be determined until after the other units of the ADF System have been installed in the aircraft and the following procedure has been performed.

NOTE

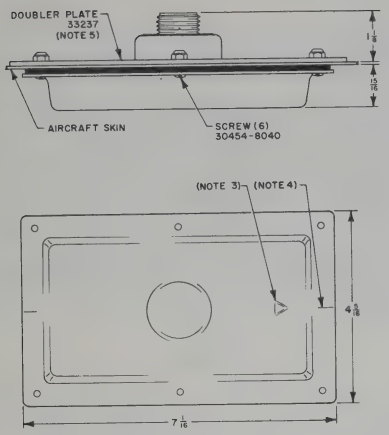
Since this procedure requires operation of the ADF System, read Section 3 before proceeding.



NOTES:

1. NOMINAL LENGTHS OF WIRE ARE FURNISHED WITH KIT. (ADDITIONAL WIRE MAY BE ORDERED SEPARATELY IN BULK.)
2. WIRES ARE NO. 18 AWG SOLID, COPPER-CLAD STEEL.
3. SEE DETAIL C FOR INSTALLATION OF INSULATOR ASSEMBLY. SCREW ON CAP AFTER SOLDERING.
4. USE SCREWS AND NUTS FURNISHED TO FASTEN ANTENNA MASTS TO AIRCRAFT.
5. LOCATE VERTICAL SECTION OF ANTENNA AS NEAR THE CENTER OF THE HORIZONTAL SECTION AS POSSIBLE.
6. ADJUST TENSION FOR 3/4-INCH SPRING DEFLECTION: THAT IS, WHEN COMPRESSED, COIL SPRING LENGTH IS 2-5/16 INCHES.

Figure 2-6. Sense Antenna Kit 19210, Installation Diagram



NOTES:

1. DIMENSIONS ARE IN INCHES.
2. WEIGHT: L-346A: 1.6 POUNDS.
   DOUBLER PLATE: 0.18 POUND.
3. ARROWHEAD INDICATES FORWARD DIRECTION.
4. LINES ON EDGES INDICATE CENTERLINE.
5. SUPPLIED ON SPECIAL ORDER.

Figure 2-7. L-346A Loop Antenna, Installation Dimensions

Step 1. Interconnect units of the ADF System as shown in Figure 2-8 and Figure 2-9, routing loop cable (32803 or 33827) through aircraft door or window so that loop antenna may be moved freely.

Step 2. Position aircraft in an area clear of objects which can cause distortion or reflection of received signal.

Step 3. Turn on ADF. Select a radio station, with a known magnetic compass bearing, which is at least 60 miles distant and operates below 500 kHz.

Step 4. Using a magnetic compass or transit, align centerline of aircraft with known station bearing. Cage DG (directional gyro), adjust to 0°, and uncage.

Step 5. Using DG, turn aircraft to a heading of 315°. (This is a relative bearing of 45° to the station.)

Step 6. Position loop antenna on centerline of aircraft with arrowhead (Figure 2-7) pointing forward; centerline of loop antenna is indicated by index markers on fore and aft edges.

Step 7. Move loop antenna forward and backward along centerline of aircraft until goniometer-indicator indicates as close to 45° as possible.

Step 8. Make certain centerlines of loop antenna and aircraft are aligned, and tape loop antenna to aircraft.

Step 9. Using DG, turn aircraft to a heading of 0° and check that goniometer-indicator indicates 0 ±5°.

Step 10. If error is greater than ±5°, rotate loop antenna slightly until error is within limits.

Step 11. Mark final position of loop antenna, remove loop antenna, and drill mounting holes in aircraft skin as shown in Figure 2-7.

Step 12. Using appropriate hardware, secure loop antenna in position.

NOTE

A doubler plate, such as Part No. 33237 (supplied on special order), may be used to permit the easy removal and reinstallation of the loop antenna. After the required mounting holes for the loop antenna have been drilled, rivet or bolt the doubler plate to the inside surface of the aircraft skin.

Step 13. Reroute loop cable inside aircraft and connect to loop antenna.

2-10. INTERCONNECTION OF UNITS.

An interconnection diagram for the Cessna 800 ADF System installation is shown in Figure 2-8. Terminate cables and wiring as shown.

2-11. LOOP COMPENSATION.

Introduction. Structural and electrical parts of the aircraft can cause distortion of the radio field pattern and introduce a quadrantal error which can affect the ADF indicatcr reading. For this reason, the indicated relative bearing of the station from which a radio signal is received must be checked every 15° to determine whether compensation is required to counteract the error.

The nonsymmetry of the coil windings of the loop antenna provides up to 7.5° of fixed compensation, which is effective with proper installation. The IN-346C and IN-346D and RA-346A and RA-346B include an adjustable, mechanical compensating device. As delivered from the factory, these units are set for 0° compensation.

For mechanical compensation, a device with adjustable screws is included in the goniometer-indicator. These screws are used to adjust the shape of a cam, which introduces a difference between the angular position of the goniometer and the angular position of the indicator pointer. The angular difference is varied as a function of the goniometer shaft so that the pointer of the indicator always indicates the true angle of arrival of the radio signal, rather than the apparent angle.

To obtain accurate results, compensation should be performed twice: first, after gathering data on the ground; then, after gathering data in flight. The data, whether gathered on the ground or during flight, is used to prepare a compensation curve.

NOTE

Do not gather data during the period starting two hours before sunset and ending two hours after sunrise. Also, select a station that is static-clear and operating below 500 kHz.

Ground Data for Loop Compensation.

To obtain ground data for loop compensation. proceed as follows:

Step 1. Position aircraft in an area clear of all objects which may cause distortion or reflections of received signal.

Step 2. Select a station having a known magnetic compass bearing. Using a compass or transit, align centerline of aircraft with magnetic bearing of station. Align 0° of dial with index of ADF indicator.

Step 3. If DG is not slaved, set it to 0°. If DG is slaved, determine heading required to produce desired relative bearings.

Step 4. Turn aircraft clockwise through 360° recording ADF indicator bearing indications every 15° on a form similar to that shown in Figure 2-10.

Step 5. Repeat Step 4, turning aircraft counterclockwise through 360°.

Flight Data for Loop Compensation. Two methods for obtaining flight data are described in the following paragraphs.

Method 1. The following procedure (See Figure 2-11) requires a fairly linear ground reference landmark, such as a road or a railroad track, directed toward a clear-channel radio station at least 60 miles distant. Possible distortion of the radio field may be caused by certain structures, such as power lines or steel towers, on the route selected. To check whether such distortion exists, crisscross the reference line at various angles, while maintaining fixed courses by means of the DG. If rapid changes in the bearing are noted as the line is crossed, distortion exists. This distortion should be eliminated either by selecting another landmark or by flying at a higher altitude.

NOTE

Steps 1 through 7 of the procedure may be made over a single point, such as a radio intersection, providing the bearing to the radio station is known. Fly a series of figure eights, always crossing the reference point on a 15° change in heading from the previous course. Record the ADF indicator bearing each time the aircraft crosses the reference point.

Step 1. With aircraft in level flight headed toward radio station, fly reference line at an altitude low enough for accurate determination of position and direction. Set DG to 0°. (If aircraft has a slaved gyro, determine heading required to produce desired relative bearings.) Turn VAR or HDG knob to align dial 0° position with index at top of ADF indicator. Turn aircraft to a 0° heading. Record relative bearing indicated by goniometer-indicator pointer on a form similar to that shown in Figure 2-10.

Step 2. Fly a sufficient distance from reference line so that it may be crossed at a heading of 15°. With aircraft held in level flight on a heading of 15°, record relative bearing of ADF indicator when reference line is crossed.

Step 3. Fly sufficiently past reference line so that line may be recrossed at a heading of 345° with aircraft in level flight (see Figure 2-11). Record bearing indication when aircraft crosses reference line.

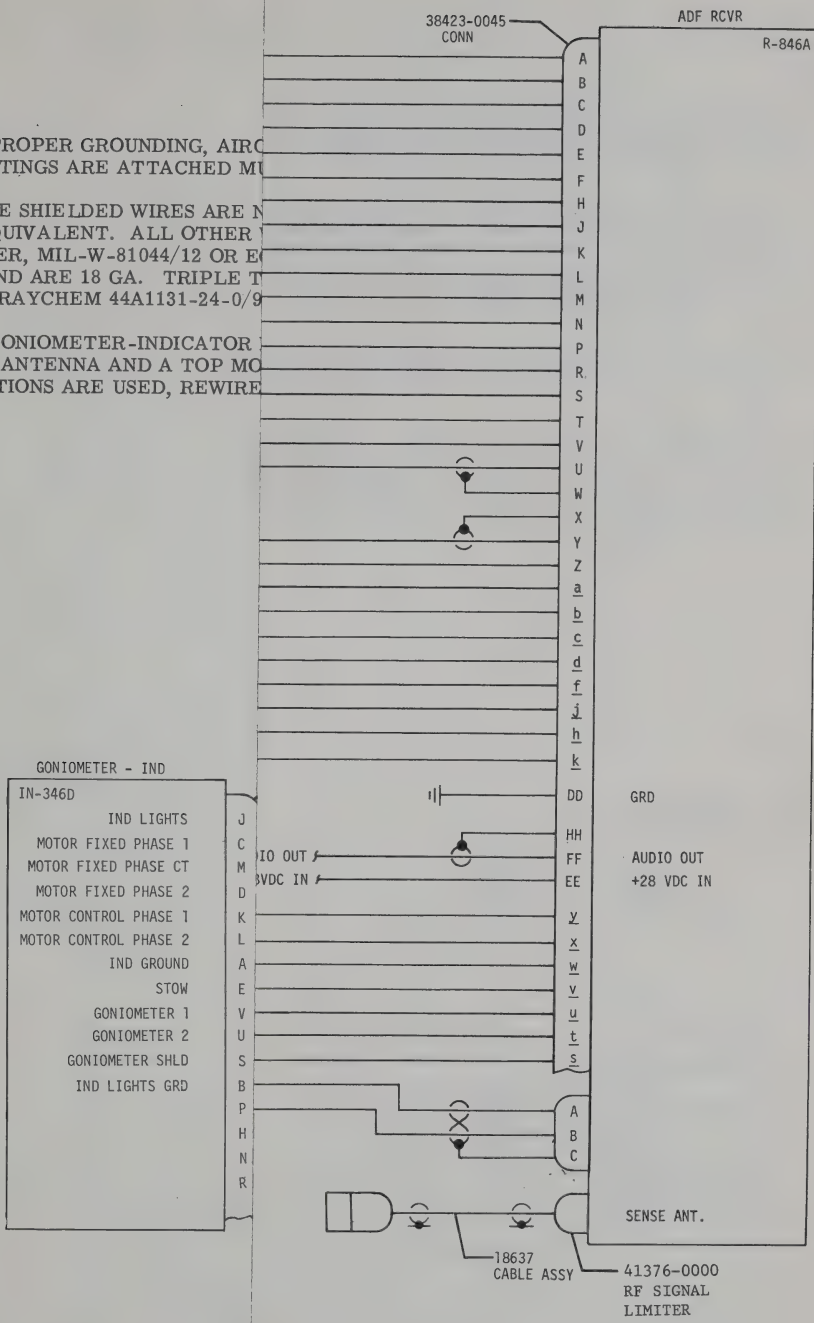
Step 4. Repeat Steps 2 and 3 for headings of 30° and 330°.

NOTES:

1. FOR PROPER GROUNDING, AIRC
   MOUNTINGS ARE ATTACHED MU

2. SINGLE SHIELDED WIRES ARE N
   OR EQUIVALENT. ALL OTHER
   COPPER, MIL-W-81044/12 OR E
   GROUND ARE 18 GA. TRIPLE T
   AWG, RAYCHEM 44A1131-24-0/9

3. THE GONIOMETER-INDICATOR
   LOOP ANTENNA AND A TOP MO
   LOCATIONS ARE USED, REWIRE



0 ADF System Interconnection Diagram

2-11. LOOP COMPENSATION.

Introduction. Structural and electrical parts of the aircraft can cause distortion of the radio field pattern and introduce a quadrantal error which can affect the ADF indicatcr reading. For this reason, the indicated relative bearing of the station from which a radio signal is received must be checked every 15° to determine whether compensation is required to counteract the error.

The nonsymmetry of the coil windings of the loop antenna provides up to 7.5° of fixed compensation, which is effective with proper installation. The IN-346C and IN-346D and RA-346A and RA-346B include an adjustable, mechanical compensating device. As delivered from the factory, these units are set for 0° compensation.

For mechanical compensation, a device with adjustable screws is included in the goniometer-indicator. These screws are used to adjust the shape of a cam, which introduces a difference between the angular position of the goniometer and the angular position of the indicator pointer. The angular difference is varied as a function of the goniometer shaft so that the pointer of the indicator always indicates the true angle of arrival of the radio signal, rather than the apparent angle.

To obtain accurate results, compensation should be performed twice: first, after gathering data on the ground; then, after gathering data in flight. The data, whether gathered on the ground or during flight, is used to prepare a compensation curve.

NOTE

Do not gather data during the period starting two hours before sunset and ending two hours after sunrise. Also, select a station that is static-clear and operating below 500 kHz.

Ground Data for Loop Compensation.

To obtain ground data for loop compensation. proceed as follows:

Step 1. Position aircraft in an area clear of all objects which may cause distortion or reflections of received signal.

Step 2. Select a station having a known magnetic compass bearing. Using a compass or transit, align centerline of aircraft with magnetic bearing of station. Align 0° of dial with index of ADF indicator.

Step 3. If DG is not slaved, set it to 0°. If DG is slaved, determine heading required to produce desired relative bearings.

Step 4. Turn aircraft clockwise through 360° recording ADF indicator bearing indications every 15° on a form similar to that shown in Figure 2-10.

Step 5. Repeat Step 4, turning aircraft counterclockwise through 360°.

Flight Data for Loop Compensation. Two methods for obtaining flight data are described in the following paragraphs.

Method 1. The following procedure (See Figure 2-11) requires a fairly linear ground reference landmark, such as a road or a railroad track, directed toward a clear-channel radio station at least 60 miles distant. Possible distortion of the radio field may be caused by certain structures, such as power lines or steel towers, on the route selected. To check whether such distortion exists, crisscross the reference line at various angles, while maintaining fixed courses by means of the DG. If rapid changes in the bearing are noted as the line is crossed, distortion exists. This distortion should be eliminated either by selecting another landmark or by flying at a higher altitude.

NOTE

Steps 1 through 7 of the procedure may be made over a single point, such as a radio intersection, providing the bearing to the radio station is known. Fly a series of figure eights, always crossing the reference point on a 15° change in heading from the previous course. Record the ADF indicator bearing each time the aircraft crosses the reference point.

Step 1. With aircraft in level flight headed toward radio station, fly reference line at an altitude low enough for accurate determination of position and direction. Set DG to 0°. (If aircraft has a slaved gyro, determine heading required to produce desired relative bearings.) Turn VAR or HDG knob to align dial 0° position with index at top of ADF indicator. Turn aircraft to a 0° heading. Record relative bearing indicated by goniometer-indicator pointer on a form similar to that shown in Figure 2-10.

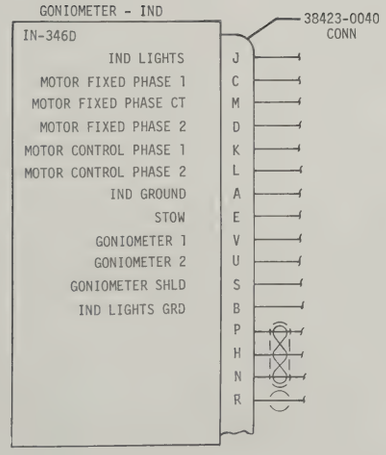
Step 2. Fly a sufficient distance from reference line so that it may be crossed at a heading of 15°. With aircraft held in level flight on a heading of 15°, record relative bearing of ADF indicator when reference line is crossed.

Step 3. Fly sufficiently past reference line so that line may be recrossed at a heading of 345° with aircraft in level flight (see Figure 2-11). Record bearing indication when aircraft crosses reference line.

Step 4. Repeat Steps 2 and 3 for headings of 30° and 330°.

NOTES:

1. FOR PROPER GROUNDING, AIRCRAFT SURFACES TO WHICH ALL MOUNTINGS ARE ATTACHED MUST BE CLEAN, BARE METAL.
2. SINGLE SHIELDED WIRES ARE NO. 24 AWG, RAYCHEM 44A1111-24-9-9 OR EQUIVALENT. ALL OTHER WIRES ARE NO. 24 AWG, STRANDED COPPER, MIL-W-81044/12 OR EQUIVALENT EXCEPT POWER AND GROUND ARE 18 GA. TRIPLE TWISTED SHIELDED WIRES ARE 24 AWG, RAYCHEM 44A1131-24-0/9/2-9.
3. THE GONIOMETER-INDICATOR IS WIRED FOR A BOTTOM-MOUNTED LOOP ANTENNA AND A TOP MOUNTED SENSE ANTENNA. IF OTHER LOCATIONS ARE USED, REWIRE IN ACCORDANCE WITH FIGURE 5-11.



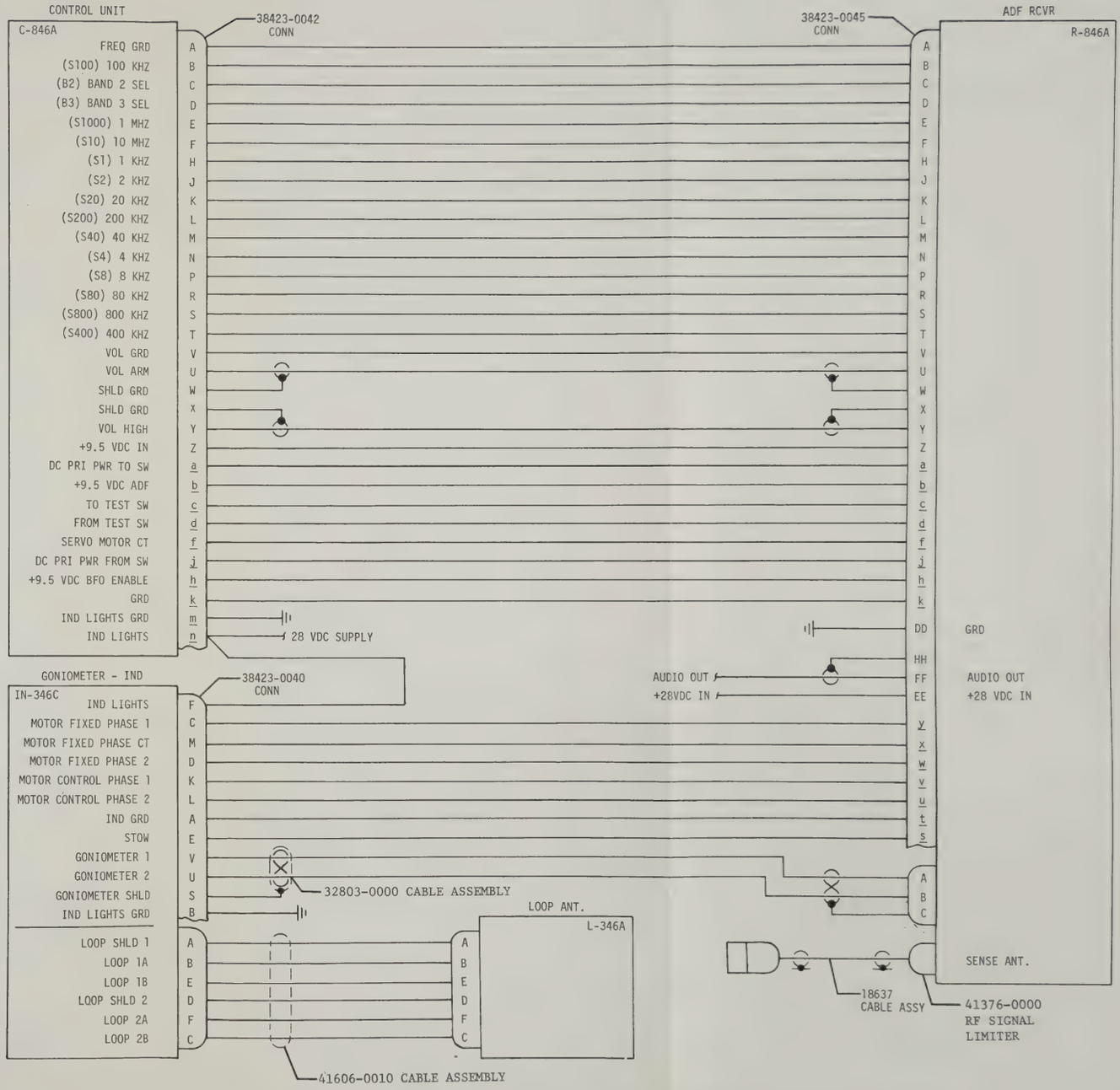
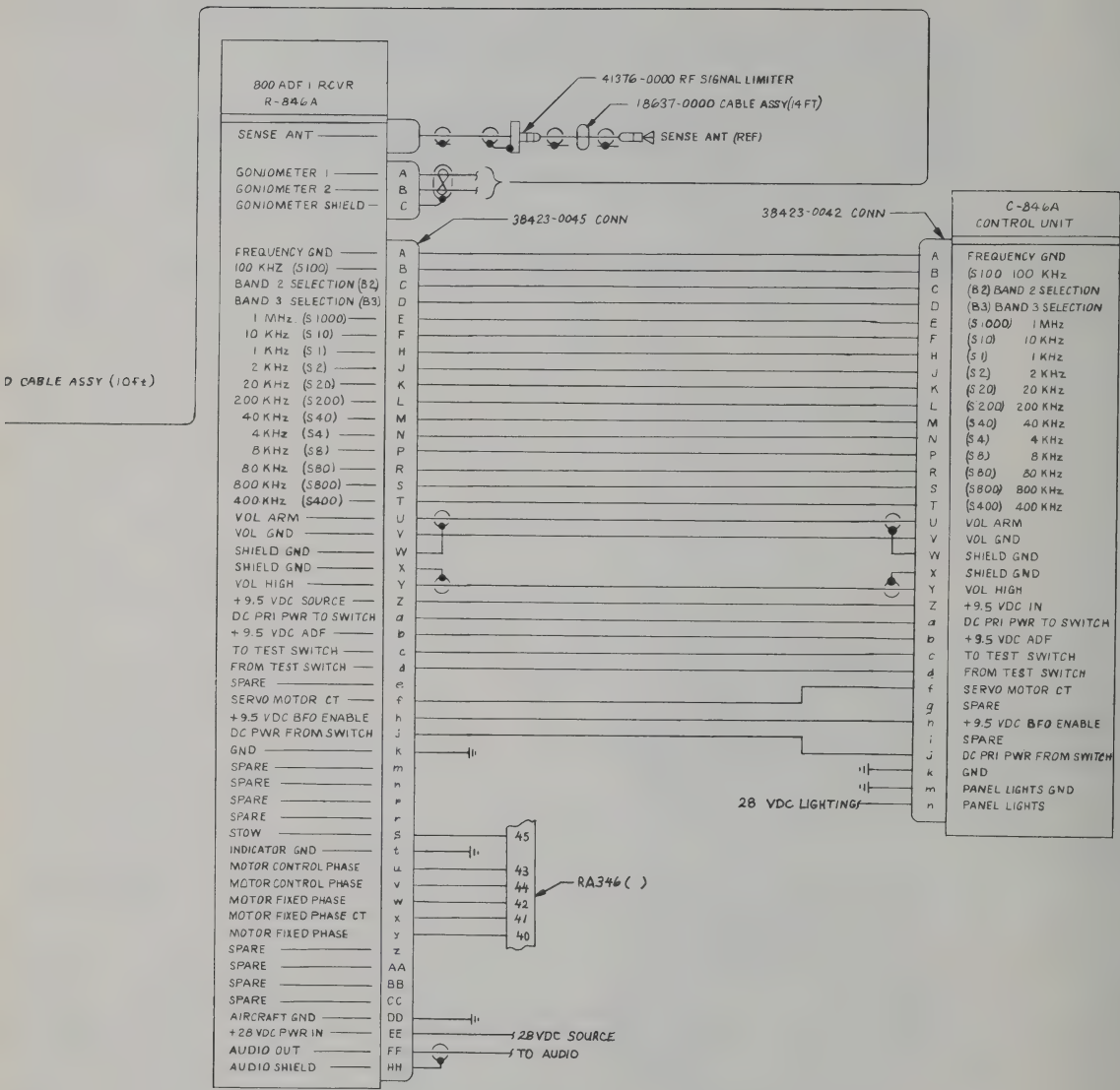


Figure 2-8. Cessna 800 ADF System Interconnection Diagram


800 ADF I RCVR
R-846A
41376-0000 RF SIGNAL LIMITER
18637-0000 CABLE ASSY(14 FT)
SENSE ANT (REF)
SENSE ANT
GONIOMETER 1
GONIOMETER 2
GONIOMETER SHIELD
38423-0045 CONN
38423-0042 CONN
C-846A
CONTROL UNIT
D CABLE ASSY (10ft)
FREQUENCY GND
100 KHZ (S100)
BAND 2 SELECTION (B2)
BAND 3 SELECTION (B3)
1 MHz (S1000)
10 KHz (S10)
1 KHz (S1)
2 KHz (S2)
20 KHz (S20)
200 KHz (S200)
40 KHz (S40)
4 KHz (S4)
8 KHz (S8)
80 KHz (S80)
800 KHz (S800)
400 KHz (S400)
VOL ARM
VOL GND
SHIELD GND
SHIELD GND
VOL HIGH
+9.5 VDC SOURCE
DC PRI PWR TO SWITCH
+9.5 VDC ADF
TO TEST SWITCH
FROM TEST SWITCH
SPARE
SERVO MOTOR CT
+9.5 VDC BFO ENABLE
DC PWR FROM SWITCH
GND
SPARE
SPARE
SPARE
SPARE
STOW
INDICATOR GND
MOTOR CONTROL PHASE
MOTOR CONTROL PHASE
MOTOR FIXED PHASE
MOTOR FIXED PHASE CT
MOTOR FIXED PHASE
SPARE
SPARE
SPARE
SPARE
AIRCRAFT GND
+28 VDC PWR IN
AUDIO OUT
AUDIO SHIELD
FREQUENCY GND
(S100 100 KHz
(B2) BAND 2 SELECTION
(B3) BAND 3 SELECTION
(S1000) 1 MHz
(S10) 10 KHz
(S1) 1 KHz
(S2) 2 KHz
(S20) 20 KHz
(S200) 200 KHz
(S40) 40 KHz
(S4) 4 KHz
(S8) 8 KHz
(S80) 80 KHz
(S800) 800 KHz
(S400) 400 KHz
VOL ARM
VOL GND
SHIELD GND
SHIELD GND
VOL HIGH
+9.5 VDC IN
DC PRI PWR TO SWITCH
+9.5 VDC ADF
TO TEST SWITCH
FROM TEST SWITCH
SERVO MOTOR CT
SPARE
+9.5 VDC BFO ENABLE
SPARE
DC PRI PWR FROM SWITCH
GND
PANEL LIGHTS GND
PANEL LIGHTS
28 VDC LIGHTING
45
43
44
42
41
40
RA346( )
28VDC SOURCE
TO AUDIO

FLIGHT DATA FOR LOOP COMPENSATION

Station Used _____ Frequency _____

Pilot _____ Recorder _____

Reference Point _____ Date _____

Aircraft Type _____ Aircraft No. _____

FLIGHT DATA			LOOP COMPENSATION DATA	
Column 1	Column 2	Column 3	Column 4	Column 5
Aircraft Relative Heading	Station Relative Bearing	ADF Indicator Reading	Goniometer Dial Reading	Compensated ADF Indicator Reading
0	360		0	
15	345		345	
30	330		—	
45	315		315	
60	300		—	
75	285		285	
90	270		—	
105	255		255	
120	240		—	
135	225		225	
150	210		—	
165	195		195	
180	180		180	
195	165		165	
210	150		—	
225	135		135	
240	120		—	
255	105		105	
270	90		—	
285	75		75	
300	60		—	
315	45		45	
330	30		—	
345	15		15	
360	0		0	

Figure 2-10. Form for Recording Flight Data for Mechanical Compensation of Loop Antenna

NOTES:

1. FOR PROPER GROUNDING, AIRCRAFT SURFACES TO WHICH ALL MOUNTINGS ARE ATTACHED MUST BE CLEAN, BARE METAL.
2. SINGLE SHIELDED WIRES ARE NO. 24 AWG, RAYCHEM 44A1111-24-9-9 OR EQUIVALENT. ALL OTHER WIRES ARE NO. 24 AWG, STRANDED COPPER, MIL-W-81044/12 OR EQUIVALENT EXCEPT POWER AND GROUND ARE 18 GA. TRIPLE TWISTED SHIELDED WIRES ARE 24 AWG, RAYCHEM 44A1131-24-0/9/2-9.
3. LENGTHS OF LOOP, SENSE, AND GONIOMETER CABLE ASSEMBLIES, AS SUPPLIED, ARE CRITICAL; DO NOT ALTER.
4. THE RECEIVER ACCESSORY IS INTERNALLY WIRED FOR BOTTOM-MOUNTED LOOP ANTENNA AND A TOP-MOUNTED SENSE ANTENNA. IF OTHER LOCATIONS ARE USED, REQIRE TERMINALS IN ACCORDANCE WITH FIGURE 5-13.

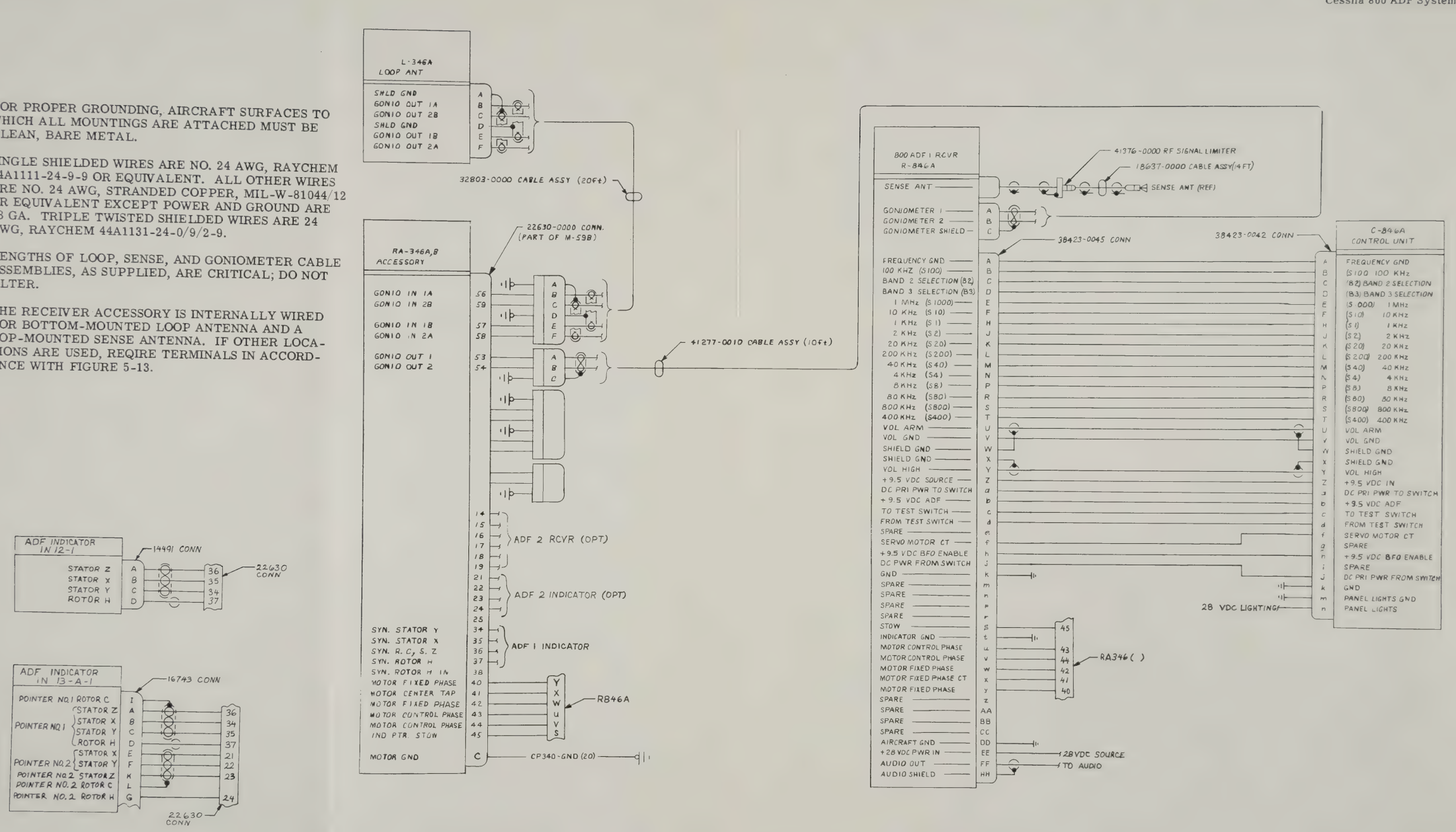


Figure 2-9. Cessna 800 ADF System with RA-346 ( ), Interconnection Diagram

FLIGHT DATA FOR LOOP COMPENSATION

Station Used _____ Frequency _____

Pilot _____ Recorder _____

Reference Point _____ Date _____

Aircraft Type _____ Aircraft No. _____

FLIGHT DATA			LOOP COMPENSATION DATA	
Column 1	Column 2	Column 3	Column 4	Column 5
Aircraft Relative Heading	Station Relative Bearing	ADF Indicator Reading	Goniometer Dial Reading	Compensated ADF Indicator Reading
0	360		0	
15	345		345	
30	330		—	
45	315		315	
60	300		—	
75	285		285	
90	270		—	
105	255		255	
120	240		—	
135	225		225	
150	210		—	
165	195		195	
180	180		180	
195	165		165	
210	150		—	
225	135		135	
240	120		—	
255	105		105	
270	90		—	
285	75		75	
300	60		—	
315	45		45	
330	30		—	
345	15		15	
360	0		0	

Figure 2-10. Form for Recording Flight Data for Mechanical Compensation of Loop Antenna

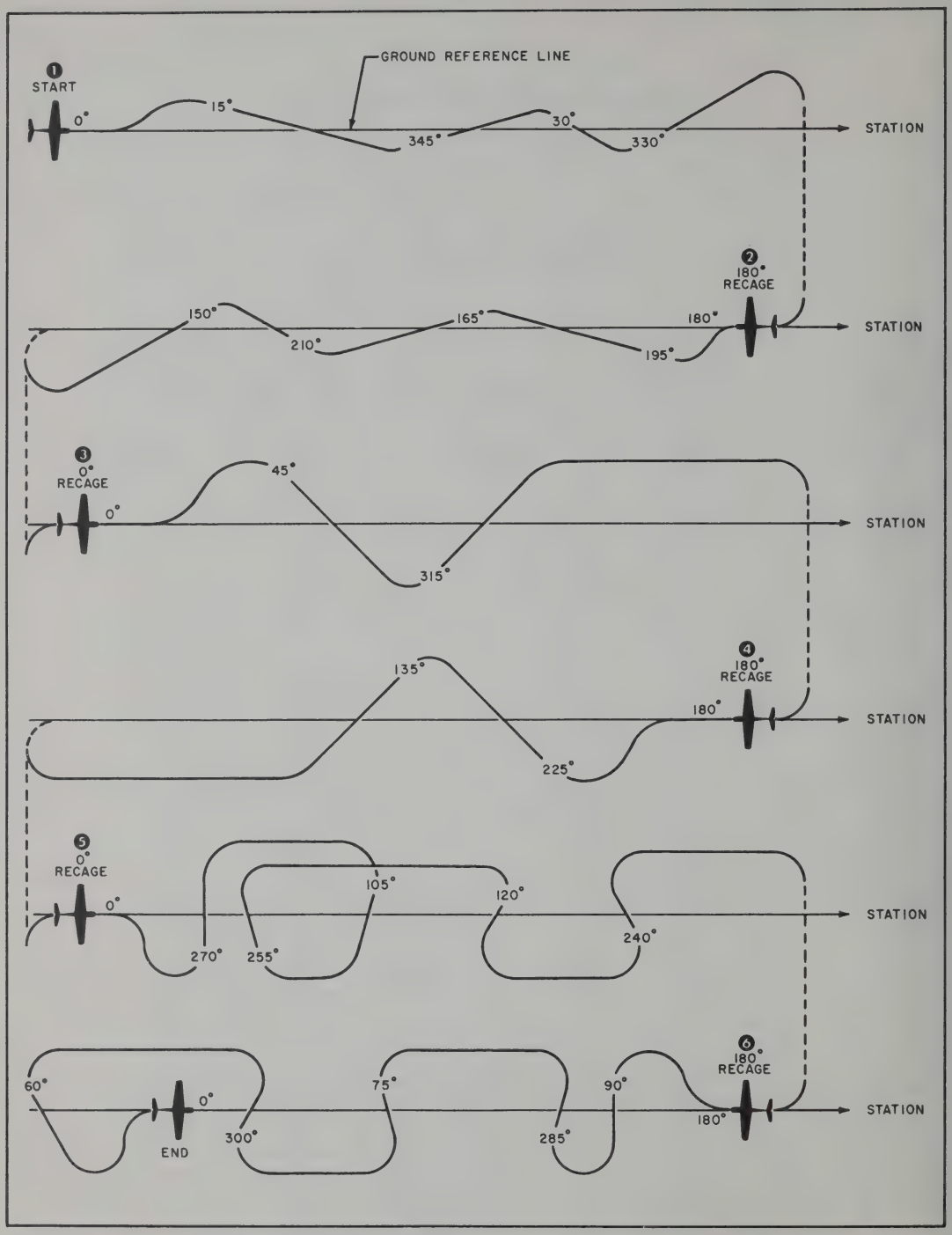


Figure 2-11. Procedure for Obtaining Flight Data for Loop Compensation, Flying Ground Reference Line

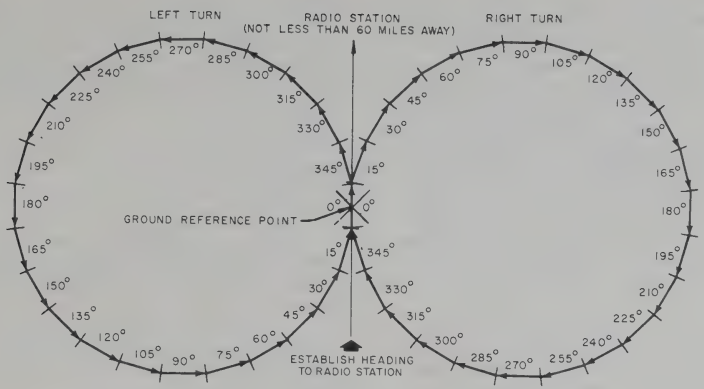


Figure 2-12. Procedure for Obtaining Flight Data for Loop Compensation, Flying Two 350° Turns

Step 5. Turn aircraft to a heading of 180° from radio station and check DG indication when heading of aircraft coincides with reference line. DG indication should be within approximately 2° of a 180° heading if all maneuvers have been made properly. If precession of DG is noted when 180° reference line course is checked, repeat procedure or check DG. Normal creeping of a free DG (2° or less over a period of 15 minutes) may be proportioned to each heading.

Step 6. With aircraft on a 180° heading away from radio station, follow a procedure similar to that outlined previously and obtain ADF indicator bearings for headings of 190°, 165°, 210°, and 150° (see Figure 2-11). Then, turn aircraft to head toward radio station along reference line, establishing a 0° heading with respect to reference line.

Step 7. Continue to fly to and from radio station, criss-crossing reference line, as shown in Figure 2-11, until indicator bearings for every 15° change in heading of aircraft have been recorded. Recorded data will be used for compensation.

Method 2. The following procedure (see Figure 2-12) requires making two 350° flight turns in opposing directions, some distance from a radio station. A landmark, such as a crossroad or a building, is used for a ground reference point from which each circle is started. Disregarding errors introduced by flight conditions or observation procedures, the accuracy of this procedure depends on the distance of the reference point from the radio station and the diameter of the two circles. The ground reference point should be as far as possible from the radio station, but still at a distance where reliable bearing indications can be obtained. The diameter of each circle should be nearly equal so that the error angles at corresponding angles of the turn circles cancel when averaged. The diameters should also be as small as possible, yet large enough so that the flying time during each chord of the circle is sufficient to permit obtaining a reliable indication. As a general recommendation, it is suggested that the distance between the ground reference point and the radio station be at least 60 miles, and that each circle have a maximum diameter of 9 miles. Before the actual flight procedure is begun, it is necessary to correlate the 0° bearing of the goniometer-indicator with the 0° heading of the aircraft. Proceed as follows:

Step 1. Head aircraft directly toward a radio station whose transmitter tower is clearly visible.

Step 2. Tune receiver to station frequency. Adjust VAR or HDG knob to align dial 0° position with index at top of indicator.

Step 3. Using a cross-hair sight which has been aligned accurately with fore-and-aft axis of aircraft, align axis of aircraft with station antenna tower as accurately as possible. If a cross-hair sight is not available, aircraft heading and tower may be aligned by an observer standing aft as far as possible, with a clear line-of-sight through vertical center of windshield, and sighting along centerline of aircraft through center of windshield. Heading checks made directly from cockpit are not reliable because parallax errors may result.

Step 4. With aircraft held in level flight, and headed directly toward station tower, note ADF indicator bearing. To confirm indication obtained, approach station tower from opposite direction and check that ADF indicator bearing is the same. Record ADF indicator bearing obtained for 0° heading of aircraft.

Flight Procedure. With the 0° ADF indicator bearing and the 0° aircraft heading correlated, the flight procedure for Method 2 may be performed (see Figure 2-12). The principle of this procedure is to obtain indications for every 15° change in heading during each of the 360° turns. To approximate a circle as closely as possible, the flying time and speed of each 15° course should be very nearly equal. After each turn has been completed, an ADF indication relative to a given DG indication will be obtained for each turn. Proceed as follows:

Step 1. Select a ground reference point which is not less than 60 miles from radio station to be used. Approach reference point so that it is between aircraft and station. Orient aircraft for a 0° bearing on ADF indicator. If previous flight procedure has established that 0° heading of aircraft does not coincide with 0° bearing of station within ±2°, fly aircraft on heading that corresponds to 0° bearing obtained in preliminary flight procedure.

Step 2. With aircraft held in steady, level flight directly toward station, set DG to 0°. (If a slaved DG is installed in the aircraft, determine the proper heading.) Maintain heading, and when aircraft is over ground reference point, record ADF indicator bearing.

Step 3. Turn aircraft smoothly and evenly to right for a heading of 15°. With aircraft leveled out on this heading for not more than 25 seconds, note and record ADF indicator bearing on a form similar to that shown in Figure 2-10.

Step 4. Turn aircraft to a heading of 30°. After level flight has been resumed, note and record ADF indicator bearing.

Step 5. Follow a similar procedure as outlined in Steps 3 and 4 for each 15° increase in heading of aircraft, until circle-turn is completed. Record ADF indicator bearings for each heading. If turn has been executed properly, aircraft should be over reference point at end of last 15° turn. Turn aircraft for a 0° ADF indicator bearing. Aircraft should now be headed directly toward radio station in line with original starting line. Check relative bearing for this heading; indication should agree with its original setting with 2° to 3° if all turns have been made properly.

Step 6. With aircraft over ground reference point and headed directly toward station, as shown by ADF indication, check that DG indication agrees with its original setting. If not, make a 0° reference check, as outlined in Steps 1 and 2 of this procedure.

Step 7. Start second 360° turn by turning the aircraft to left for a 345° heading. When aircraft is in steady, level flight on this heading, record ADF indicator bearing.

Step 8. Continue circle-turn, until completed, decreasing heading in 15° intervals. Keep diameter of this left turn as equivalent as possible to right turn made previously. Record ADF indicator bearing for each 15° change in heading.

Step 9. Average right-turn and left-turn ADF indicator bearings for each corresponding DG heading.

2-12. MECHANICAL COMPENSATION.

Preparation of Compensation Data Curve. If the IN-346C or IN-346D is part of the ADF installation, mechanical compensation is used to correct the quadrantal error. After the compensation data has been recorded, the data is plotted and the resulting curve is used to determine the compensation adjustments. For a dual ADF installation, separate curves are prepared for each ADF. Plot the curve as follows:

Step 1. Using a form similar to that shown in Figure 2-13, lay a straight edge parallel to the sloping dotted line and through the data point of Column 3 on the horizontal scale, and draw a fine line (see Figure 2-14). The point at which this line intersects the solid line is the plot point. (The example shown in Figure 2-14 indicates that for an actual bearing of 15°, the ADF indicator bearing is 30°.)

Step 2. Repeat Step 1 for each of the other 15° positions.

Step 3. Connect plot points to form compensation data curve.

Step 4. Determine corrected ADF indicator bearing values for Column 5 of Figure 2-10 (see Figure 2-14 for example) from resulting curve as follows:

a. Draw fine lines parallel to solid lines at intersections of plotted curve and dotted lines corresponding to degree values given in Column 4 of Figure 2-10.

b. In Column 5 of Figure 2-10, record the values for the points of intersection as read on the horizontal graduations beside the 15° dotted line values in Column 4 of Figure 2-10. For example: To determine corrected ADF indicator bearing of 45° (Column 4), lay straight edge parallel to solid line and draw a fine line through intersection of dotted 45° line and curve (see Figure 2-14). This line passes through the horizontal graduations at 63° This value is recorded in Column 5. Similarly, a bearing of 105° from Column 4 gives a bearing of 100° for Column 5.

Goniometer-Indicator Compensation Adjustment. To compensate the IN-346C or IN-346D Goniometer-Indicator, see Figure 2-15, and proceed as follows:

Step 1. Disconnect cables from goniometer-indicator and remove instrument from mounting panel. (Compensation can be performed without power applied to goniometer-indicator.)

Step 2. Remove cover from goniometer-indicator. Remove screw in rear plate and swing hinged, rear plate down.

Step 3. Using VAR knob, align 0° on dial with index.

Step 4. Using goniometer drive gear, align 0° mark on goniometer drum dial with fiducial. Hold goniometer-indicator so that all gears rotate freely.

Step 5. Adjust 0° compensation screw until goniometer-indicator pointer indicates computed value for 0° in Column 5 of Figure 2-10.

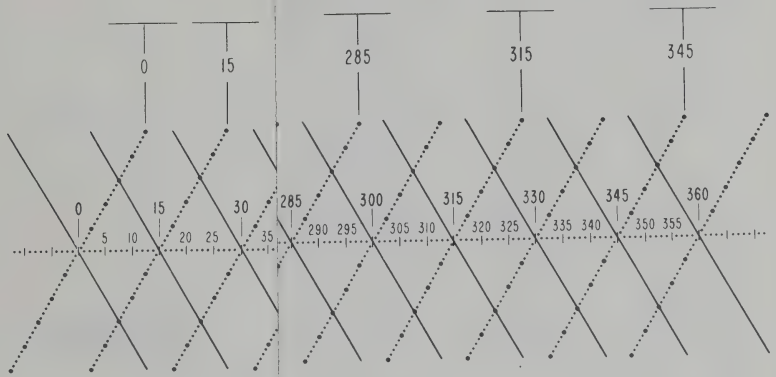
CAUTION

Do not force screws. It may appear that the compensation available at a particular point is insufficient to make the indicator read correctly. If this condition occurs, do not force the screw being adjusted, but proceed to set the other screws. When, as required by Step 8, the procedure is repeated, it will be found that sufficient compensation is available from all screws.

Step 6. Using goniometer drive gear, align 15°

STATION USED ..... DATE .....

PILOT ..... AIRCRAFT NO. .....



or Plotting Loop Compensation Data Curve

Step 1. Select a ground reference point which is not less than 60 miles from radio station to be used. Approach reference point so that it is between aircraft and station. Orient aircraft for a 0° bearing on ADF indicator. If previous flight procedure has established that 0° heading of aircraft does not coincide with 0° bearing of station within ±2°, fly aircraft on heading that corresponds to 0° bearing obtained in preliminary flight procedure.

Step 2. With aircraft held in steady, level flight directly toward station, set DG to 0°. (If a slaved DG is installed in the aircraft, determine the proper heading.) Maintain heading, and when aircraft is over ground reference point, record ADF indicator bearing.

Step 3. Turn aircraft smoothly and evenly to right for a heading of 15°. With aircraft leveled out on this heading for not more than 25 seconds, note and record ADF indicator bearing on a form similar to that shown in Figure 2-10.

Step 4. Turn aircraft to a heading of 30°. After level flight has been resumed, note and record ADF indicator bearing.

Step 5. Follow a similar procedure as outlined in Steps 3 and 4 for each 15° increase in heading of aircraft, until circle-turn is completed. Record ADF indicator bearings for each heading. If turn has been executed properly, aircraft should be over reference point at end of last 15° turn. Turn aircraft for a 0° ADF indicator bearing. Aircraft should now be headed directly toward radio station in line with original starting line. Check relative bearing for this heading; indication should agree with its original setting with 2° to 3° if all turns have been made properly.

Step 6. With aircraft over ground reference point and headed directly toward station, as shown by ADF indication, check that DG indication agrees with its original setting. If not, make a 0° reference check, as outlined in Steps 1 and 2 of this procedure.

Step 7. Start second 360° turn by turning the aircraft to left for a 345° heading. When aircraft is in steady, level flight on this heading, record ADF indicator bearing.

Step 8. Continue circle-turn, until completed, decreasing heading in 15° intervals. Keep diameter of this left turn as equivalent as possible to right turn made previously. Record ADF indicator bearing for each 15° change in heading.

Step 9. Average right-turn and left-turn ADF indicator bearings for each corresponding DG heading.

2-12. MECHANICAL COMPENSATION.

Preparation of Compensation Data Curve. If the IN-346C or IN-346D is part of the ADF installation, mechanical compensation is used to correct the quadrantal error. After the compensation data has been recorded, the data is plotted and the resulting curve is used to determine the compensation adjustments. For a dual ADF installation, separate curves are prepared for each ADF. Plot the curve as follows:

Step 1. Using a form similar to that shown in Figure 2-13, lay a straight edge parallel to the sloping dotted line and through the data point of Column 3 on the horizontal scale, and draw a fine line (see Figure 2-14). The point at which this line intersects the solid line is the plot point. (The example shown in Figure 2-14 indicates that for an actual bearing of 15°, the ADF indicator bearing is 30°.)

Step 2. Repeat Step 1 for each of the other 15° positions.

Step 3. Connect plot points to form compensation data curve.

Step 4. Determine corrected ADF indicator bearing values for Column 5 of Figure 2-10 (see Figure 2-14 for example) from resulting curve as follows:

a. Draw fine lines parallel to solid lines at intersections of plotted curve and dotted lines corresponding to degree values given in Column 4 of Figure 2-10.

b. In Column 5 of Figure 2-10, record the values for the points of intersection as read on the horizontal graduations beside the 15° dotted line values in Column 4 of Figure 2-10. For example: To determine corrected ADF indicator bearing of 45° (Column 4), lay straight edge parallel to solid line and draw a fine line through intersection of dotted 45° line and curve (see Figure 2-14). This line passes through the horizontal graduations at 63° This value is recorded in Column 5. Similarly, a bearing of 105° from Column 4 gives a bearing of 100° for Column 5.

Goniometer-Indicator Compensation Adjustment. To compensate the IN-346C or IN-346D Goniometer-Indicator, see Figure 2-15, and proceed as follows:

Step 1. Disconnect cables from goniometer-indicator and remove instrument from mounting panel. (Compensation can be performed without power applied to goniometer-indicator.)

Step 2. Remove cover from goniometer-indicator. Remove screw in rear plate and swing hinged, rear plate down.

Step 3. Using VAR knob, align 0° on dial with index.

Step 4. Using goniometer drive gear, align 0° mark on goniometer drum dial with fiducial. Hold goniometer-indicator so that all gears rotate freely.

Step 5. Adjust 0° compensation screw until goniometer-indicator pointer indicates computed value for 0° in Column 5 of Figure 2-10.

CAUTION

Do not force screws. It may appear that the compensation available at a particular point is insufficient to make the indicator read correctly. If this condition occurs, do not force the screw being adjusted, but proceed to set the other screws. When, as required by Step 8, the procedure is repeated, it will be found that sufficient compensation is available from all screws.

Step 6. Using goniometer drive gear, align 15°

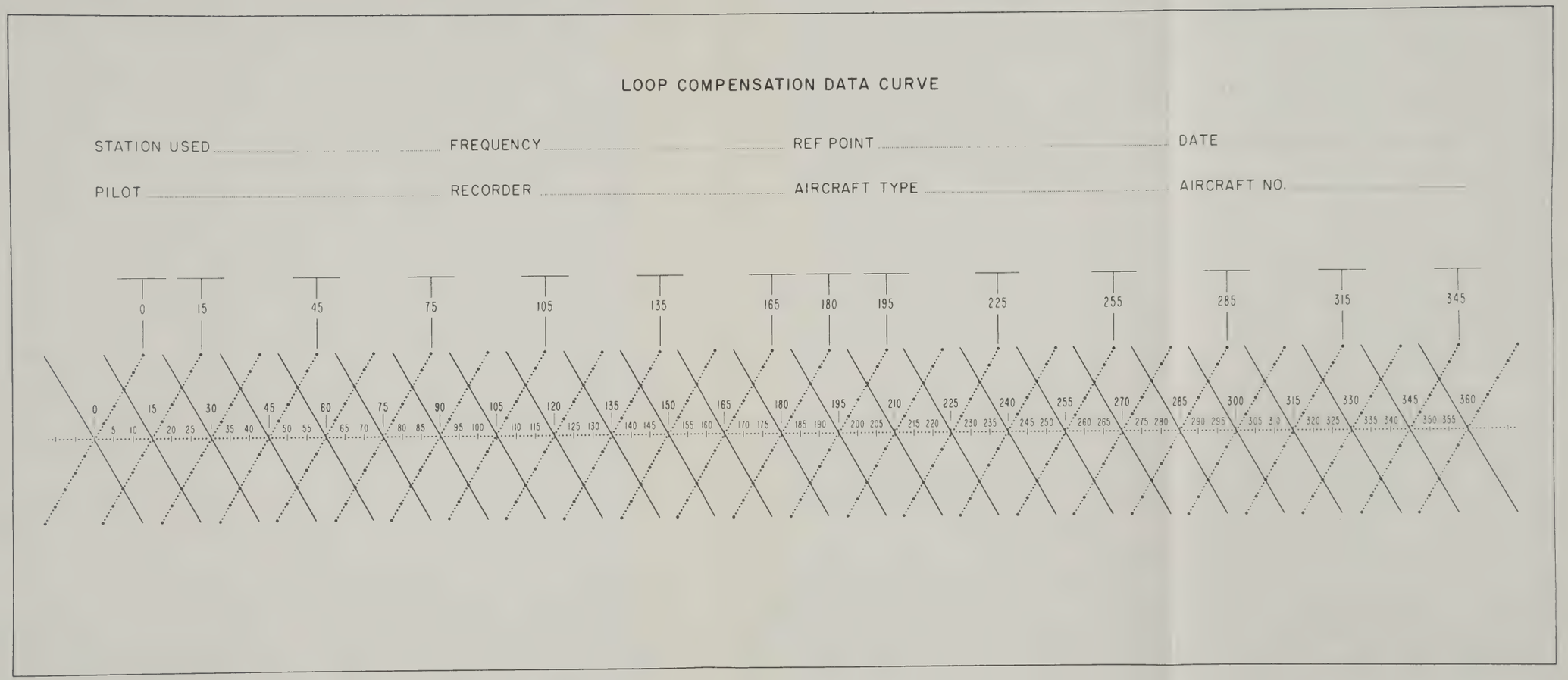
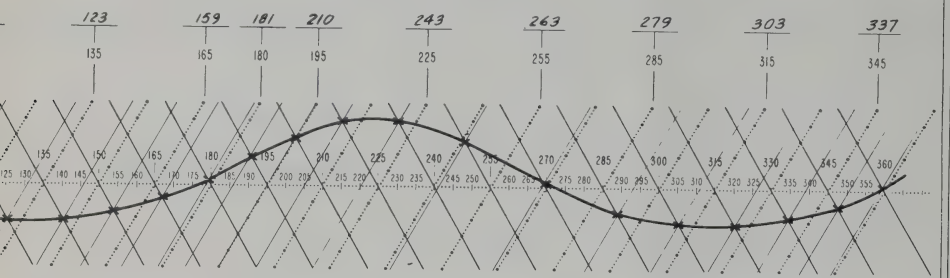


Figure 2-13. Form for Plotting Loop Compensation Data Curve

LOOP COMPENSATION DATA CURVE

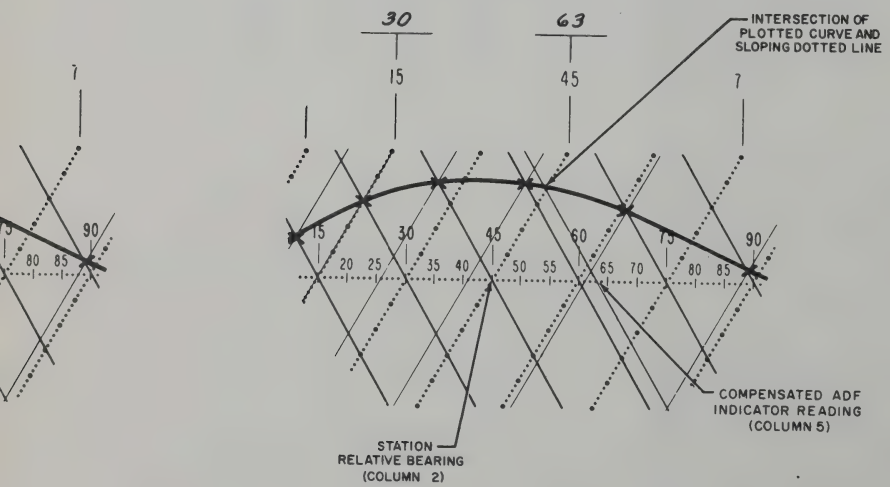
30 KC ..... REF POINT ARC AIRFIELD ..... DATE NOVEMBER 2, 1966

E. KLENA ..... AIRCRAFT TYPE TYPICAL FIXED WING ..... AIRCRAFT NO. N12345



PLOTTED COMPENSATION CURVE

DETAIL 2



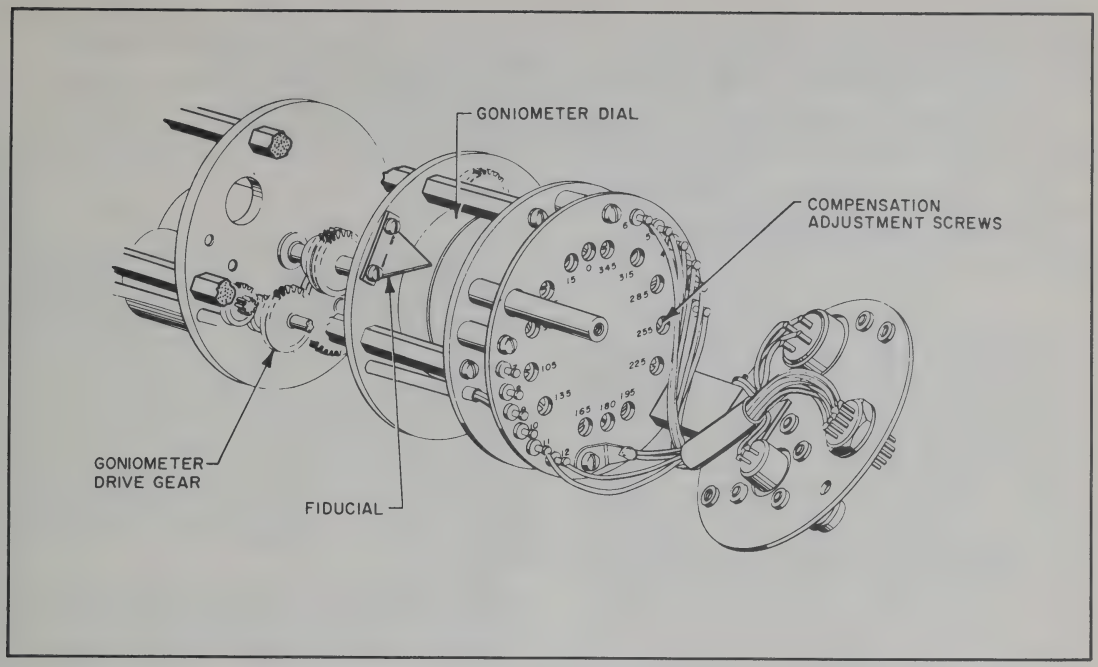


Figure 2-15. IN-346C and IN-346D Goniometer Indicators, Compensation Adjustment Points

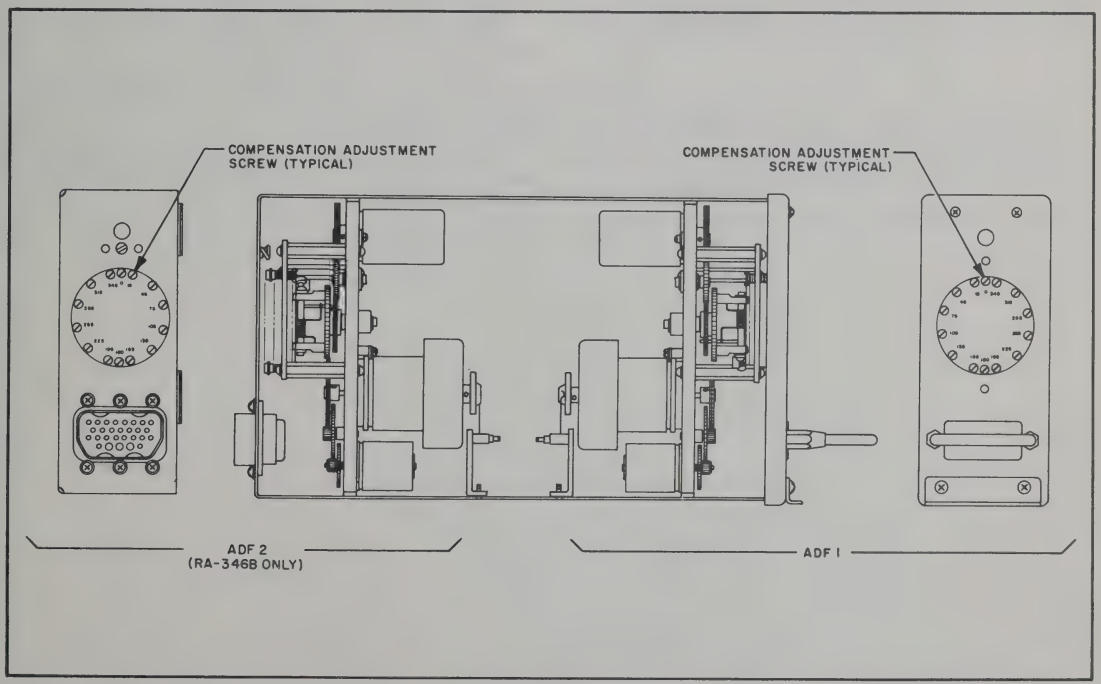


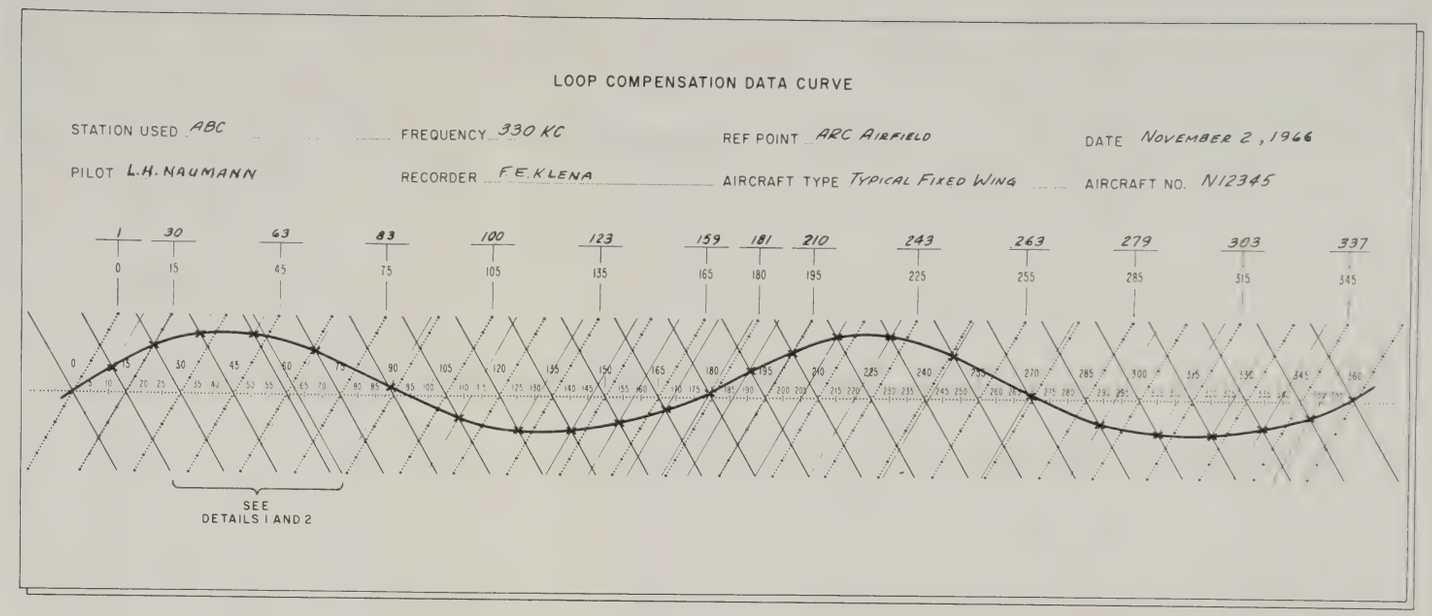
Figure 2-16. RA-346A or RA-346B Receiver Accessory, Compensation Adjustment Points

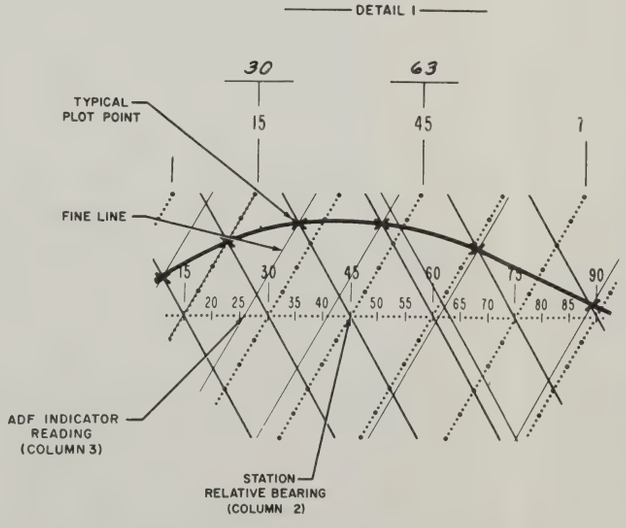
FLIGHT DATA FOR LOOP COMPENSATION

Station Used ABC — Frequency 330 KC
Pilot CARL TORNABENE — Recorder JOHN BUONO
Reference Point ARC AIRFIELD — Date NOVEMBER 2, 1972
Aircraft Type TYPICAL FIXED WING — Aircraft No. N12345

FLIGHT DATA			LOOP COMPENSATION DATA	
Column 1	Column 2	Column 3	Column 4	Column 5
Aircraft Relative Heading	Station Relative Bearing	ADF Indicator Reading	Goniometer Dial Reading	Compensated ADF Indicator Reading
0	360	359	0	1
15	345	350	345	337
30	330	339	—	—
45	315	326	315	303
60	300	311	—	—
75	285	293	285	279
90	270	269	—	—
105	255	241	255	263
120	240	220	—	—
135	225	205	225	243
150	210	195	—	—
165	195	186	195	210
180	180	179	180	181
195	165	169	165	159
210	150	158	—	—
225	135	146	135	123
240	120	131	—	—
255	105	112	105	100
270	90	88	—	—
285	75	61	75	83
300	60	41	—	—
315	45	26	45	63
330	30	15	—	—
345	15	7	15	30
360	0	359	0	1

RECORDED FLIGHT DATA





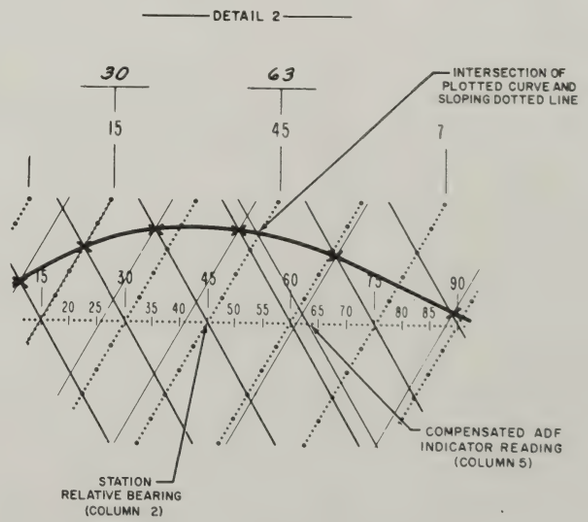


Figure 2-14. Example of Recorded Flight Data and Loop Compensation Curve

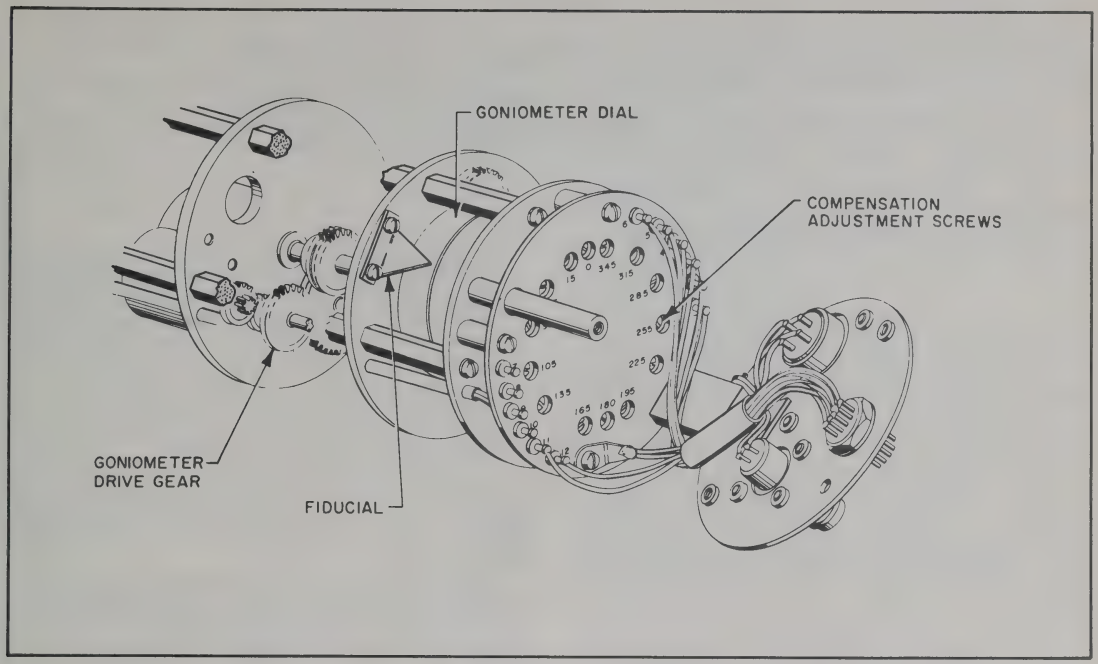


Figure 2-15. IN-346C and IN-346D Goniometer Indicators, Compensation Adjustment Points

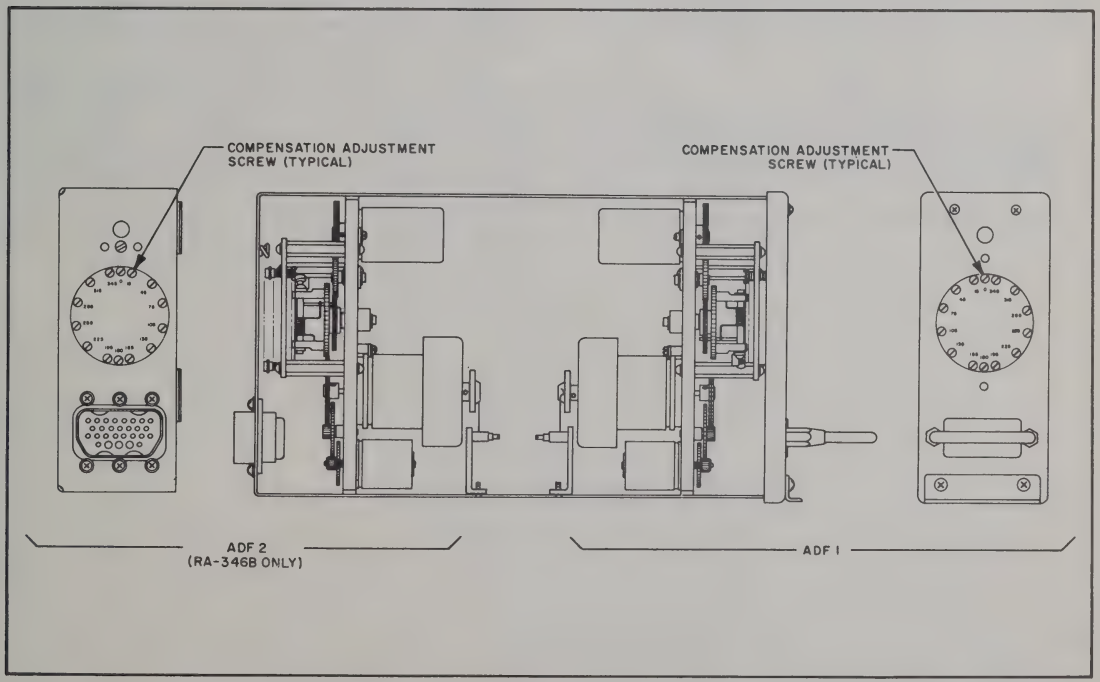


Figure 2-16. RA-346A or RA-346B Receiver Accessory, Compensation Adjustment Points

mark on goniometer dial with fiducial. Adjust 15° compensation screw until goniometer-indicator pointer indicates computed value for 15° in Column 5 of Figure 2-10.

Step 7. Continue adjustment for each screw using computed value in Column 5 of Figure 2-10 for screw being adjusted.

Step 8. Repeat Steps 4 through 7 until satisfactory compensation has been achieved.

Step 9. Reassemble and reinstall goniometer-indicator.

Receiver Accessory Adjustment Procedure. The compensation mechanisms in the receiver accessory units are shown in Figure 2-16. The mechanisms are identical and the procedure for adjustment of the mechanisms is the same. When the rear mechanism in the RA-346B is adjusted, an extension cable is required between the mounting and the RA-346B to provide access to the compensation screws. When performing the adjustment procedures, power must be supplied to the receiver accessory synchro transmitters and the ADF indicator synchro receivers. Power may be obtained by interconnecting the receiver accessory with the associated ADF set and applying power from the receiver. (Set receiver function switch to the REC or ADF position.) Power may also be supplied by connecting the receiver accessory and ADF indicator to a 13-volt, 100-cps or 26-volt, 400-cps supply. The latter method allows the receiver accessory to be removed from the aircraft for compensation and eliminates the need for an extension cable between the mounting and the RA-346B.

NOTE

Since all the compensation mechanisms are identical, only compensation of the front mechanism (ADF 1) will be described.

Step 1. Remove dust cover from accessory unit.

Step 2. Interconnect receiver accessory and ADF indicator and apply power.

Step 3. Using VAR knob, align 0° on dial with index on front of ADF indicator.

Step 4. By rotating gears on forward gear assembly, align goniometer drum 0° mark with fiducial.

CAUTION

Do not force screws. In the following procedure, it may appear at first that the compensation available at a particular point is insufficient to make the ADF indicator read correctly. If this occurs, do not force the screw in question, but proceed to set the other screws. When, as required by step 8, the adjustment procedure is repeated, it will be found that sufficient compensation is available at all adjustment points.

Step 5. Adjust 0° compensation screw until pointer No. 1 on ADF indicator indicates computed value for 0° as shown in column 5 of Figure 2-10 for ADF set No. 1.

Step 6. Align 15° mark on goniometer dial with fiducial. Adjust the 15° compensation screw until ADF pointer No. 1 indicates computed value for 15° as shown in column 5 of Figure 2-10 for ADF set No. 1

Step 7. Continue adjustment for each screw using computed value shown in column 5 of Figure 2-10 for ADF set No. 1 for each screw being adjusted.

Step 8. Repeat steps 4 through 7 until satisfactory compensation has been achieved.

Step 9. If required, repeat procedure for rear assembly (ADF 2) using point No. 2 on the ADF indicator and computed values of column 5, Figure 2-10, for ADF set No. 2.

Step 10. Disconnect power, replace dust cover, and install receiver accessory and ADF indicator in aircraft.

SECTION III

OPERATION

3-1. GENERAL.

This section defines the functions of the operating controls and indicators for the Cessna 800 ADF System and outlines the general operating procedure. Detailed operating procedures are described and illustrated in the owner's manual.

3-2. OPERATING CONTROLS AND INDICATORS.

Control Unit. Except for the HDG or VAR control on the goniometer-indicator, all operating controls for the ADF System are located on the front panel of the control unit, shown in Figure 3-1. The functions of these controls are as follows:

1. VOL - Power on-off and volume control. Clockwise rotation turns power on and controls audio output level. Full counterclockwise rotation disconnects power, except to panel lamps.

2. FREQUENCY SELECTORS - Knob (A) selects 100-kHz increments of receiver frequency, knob (B) selects 10-kHz increments, and knob (C) selects 1-kHz increments.

3. FUNCTION SELECTOR -
   ADF - Set operates as automatic direction finder using loop and sense antennas.
   REC - Set operates as communication receiver using only sense antenna.
   BFO - Set operates as communication receiver using only sense antenna and activates 1000-Hz tone beat frequency oscillator to permit identification of keyed CW signals.

4. TEST - Momentary-on switch used only with ADF function to test bearing reliability. When depressed, slews indicator pointer; when released, if bearing is reliable, pointer returns to original position.

Goniometer-Indicator. The VAR knob on the IN-346C and IN-346D rotate the goniometer-indicator dial to introduce relative, magnetic, or true bearing information. Each goniometer-indicator also includes a fixed index and a pointer. When the VAR control is adjusted, the index indicates the relative, magnetic, or true heading of the aircraft, and the pointer indicates the relative, magnetic, or true bearing of the station from which the radio signal is being received. In the REC or BFO operating mode, the pointer is automatically stowed at the 90-degree position.

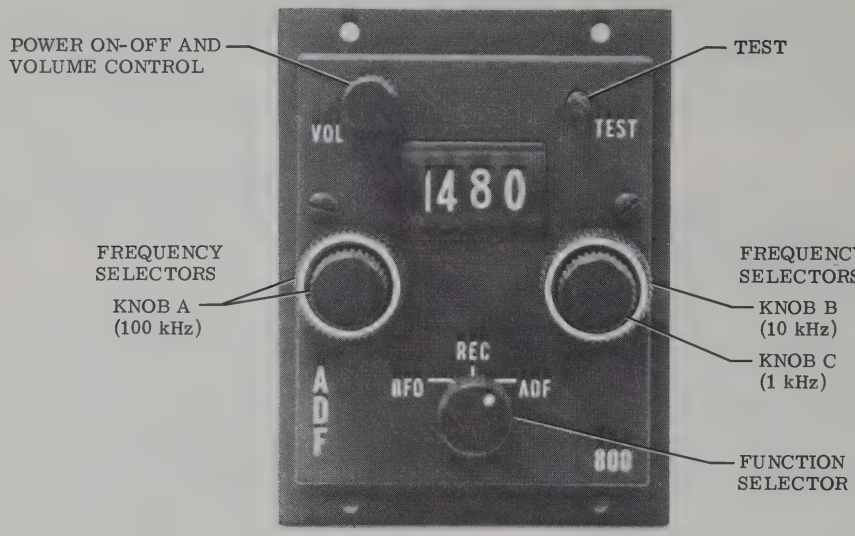
3-3. OPERATING PROCEDURE.

Step 1. Turn set on and set function selector switch to ADF, REC, or BFO.

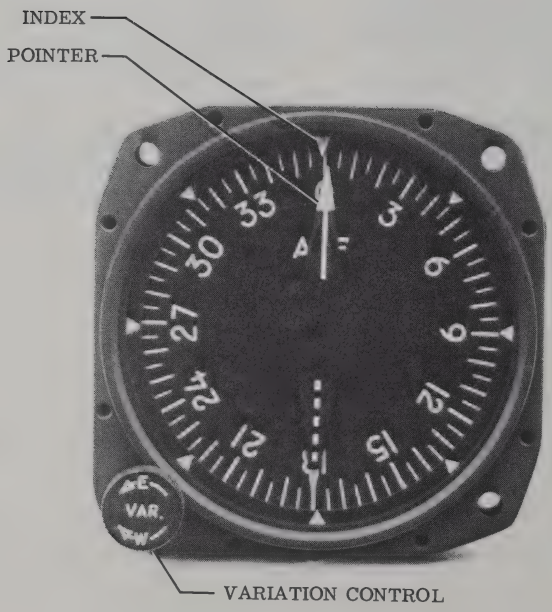
Step 2. Select operating frequency.

Step 3. Adjust VOL control for desired audio level.

Step 4. In ADF mode of operation, to check bearing reliability, push in and hold TEST button until pointer slews off indicated bearing. Release pushbutton; pointer will return to original position if signal is reliable.



C-846A CONTROL UNIT



IN-346C AND IN-346D
GONIOMETER-INDICATORS

Figure 3-1. Cessna 800 ADF, Operating Controls and Indicators

SECTION IV

MAINTENANCE

4-1. INTRODUCTION.

This section contains a list of test equipment and accessories required for servicing the Cessna 800 ADF System; it also contains performance checks, alignment and adjustment procedures, and typical measurements.

4-2. TEST EQUIPMENT AND ACCESSORIES.

Table 4-1 lists the recommended test equipment and accessories that are required for maintenance. Equivalent test equipment and accessories may be substituted. Use of either the SA-40C Antenna Position Simulator or a calibrated shielded room is required.

If a calibrated shielded room [1] is used, provision must be made for the sense antenna input to the receiver. For this purpose, an RF capacitive line divider must be connected between the signal generator, which energizes the shielded room radiating wire, and the sense antenna cable. This line divider must have an attenuation of 4:1 for 1/4-meter effective height times the shielded room field attenuation factor[2] and, in addition, must have an output capacitance of 50 pF. An RF line divider for a shielded room and a table listing the capacitor values for several room factors are shown in Figure 4-1. The addition of a 50 pF dummy antenna capacitor and a DPDT switch as a function selector switch provides a convenient method of selecting either the communication (ANT) or ADF (COMP) signal input for the receiver.

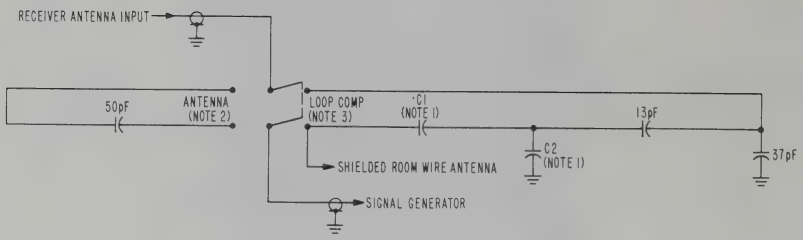
[1] The construction and calibration of a suitable shielded room is described in Radio Technical Commission for Aeronautics paper 85-56/DO-70, RTCA Secretariat, 1717 H. Street, N. W., Washington, D. C. 20006.

[2] Shielded room attenuation factor = $\frac{\text{signal generator output } (\mu V)}{\text{field strength } (\mu V/\text{meter})}$

TABLE 4-1. TEST EQUIPMENT AND ACCESSORIES

Name	Designation or Characteristic
Antenna Position Simulator	ARC Type SA-40C
Shielded Room*	(Refer to paragraph 4-2.)
Signal Generator	Hewlett-Packard Model 606A
Audio Oscillator	Hewlett-Packard Model 200AB
Frequency Counter	Hewlett-Packard Model 5216A
Voltmeter	Hewlett-Packard Model 410C
Voltmeter	Ballantine Model 300D
RF Voltmeter	Boonton Electronics Model 91DA
Power Supply	0-36, Vdc, 3 A minimum (with a built-in ammeter)
Oscilloscope	Tektronix Model 310A
Stop Watch	Central Scientific Model 73536 (0-10 seconds)
Oscilloscope Probe	Tektronix Model 013-071 10X
ADF Indicator	ARC IN-12-1
Test Pointer	ARC 28775-0005 or -0006
Receiver Cable Assembly	(See Figure 2-8)
Goniometer Cable Assembly	ARC 41606-0010, -0020, or -0030
Loop Cable Assembly	ARC 33287 or ARC 32803
Sense Antenna Cable Assembly	ARC 17984 or ARC 18637
Test Extender Card	ARC 41219
Test Extender Card	ARC 41366

* Necessary only if SA-40C Antenna Position Simulator is not available.



NOTES:

1. TO DETERMINE VALUE OF C1 AND C2 (IN pF) FOR ANY ROOM FACTOR, USE THE FOLLOWING FORMULA.

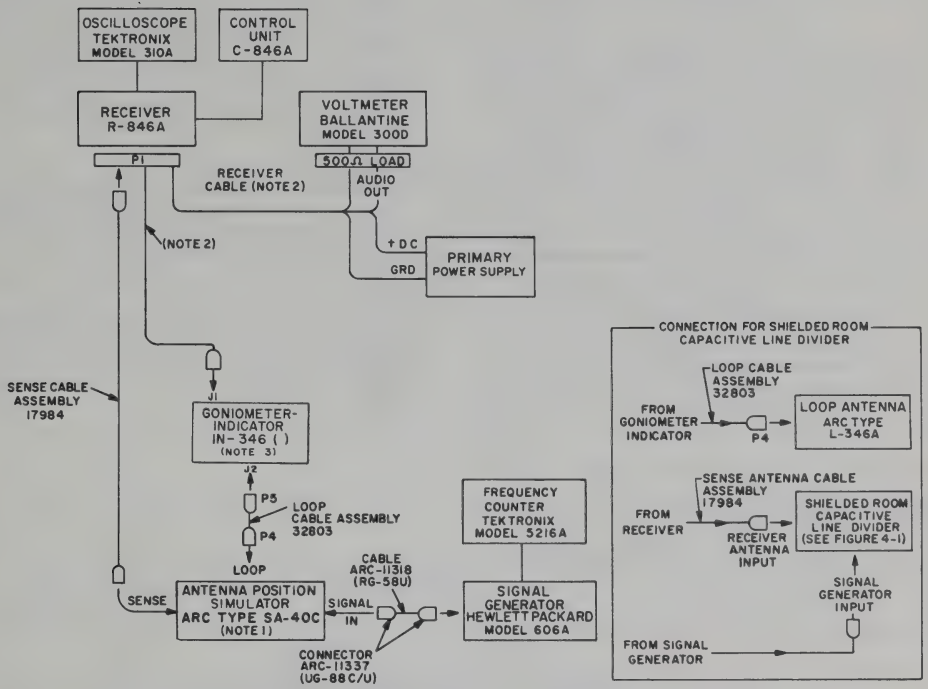
$$\text{ROOM FACTOR} = \frac{C1 + C2}{C1}$$

FOR KNOWN ATTENUATION RATIOS, THE FOLLOWING CHART MAY BE USED.

Room Factor	10:1	9:1	8:1	7:1	6:1	5:1	4:1	3:1
C1 (pF)	100	100	100	100	100	100	100	100
C2 (pF)	900	800	700	600	500	400	300	200

2. IN ANT POSITION, THE SIGNAL GENERATOR INDICATES THE ANTENNA OPEN-CIRCUIT MICROVOLTS DIRECTLY.
3. IN COMP POSITION, THE SIGNAL GENERATOR OUTPUT DIVIDED BY THE ROOM FACTOR IS EQUAL TO MICROVOLTS/METER FIELD STRENGTH.

Figure 4-1. Capacitive Line Divider for Shielded Room



NOTES:

1. IF ANTENNA POSITION SIMULATOR IS NOT AVAILABLE, MAKE ALTERNATE CONNECTIONS SHOWN FOR SHIELDED ROOM CAPACITIVE LINE DIVIDER.

2. SEE FIGURE 2-8 FOR RECEIVER INTERCONNECT CABLE INFORMATION.

3. RA-346( ) RECEIVER ACCESSORY AND ADF INDICATOR MAY BE SUBSTITUTED FOR IN-346( ) GONIOMETER-INDICATOR.

Figure 4-2. Cessna 800 ADF System, Bench Test Interconnection Diagram

4-3. PERFORMANCE CHECKS.

General. Procedures for checking the performance of the Cessna 800 ADF System are given in Table 4-2. The test equipment required is listed in Table 4-1. The bench test interconnections are shown in Figure 4-2. Unless otherwise specified, all operating controls referenced in the table are located on the control unit.

Signal Source. As shown in Figure 4-2, the output of the signal generator is connected either to the SIG GEN connector on the antenna position simulator or to the input connector of the shielded room capacitive line divider. When the FUNCTION switch of the antenna position simulator or shielded room is in the ANT position, the signal generator is fed through a 50 pF capacitor to the 100 pF sense antenna cable. In the LOOP COMP position, the signal from the signal generator is coupled to the sense antenna cable to provide 1/4-meter antenna effective height and also to feed one of two wire radiators which supply the loop signal. The BEARING TEST switch of the antenna position simulator determines which wire radiator is used. Since the goniometer-indicator pointer may not indicate the bearing selected by the BEARING TEST switch, the correct pointer positions for the different antenna locations are as follows:

Bearing Test Switch	TOP LOOP		BOTTOM LOOP	
	Top Sense	Bottom Sense	Top Sense	Bottom Sense
0°	180°	0°	0°	180°
90°	90°	270°	90°	270°

The LOOP COMP position of the antenna position simulator FUNCTION switch also provides direct conversion of signal generator microvolts to microvolts/meter field strength. The LOOP COMP position of the capacitive line divider FUNCTION switch, when used in a calibrated shielded room, also provides conversion to microvolts/meter field strength, but the microvolt output of the signal generator must be divided by the "room factor" to obtain the microvolts/meter field strength at the antenna input to the receiver. In the ANT position, the microvolt output of the signal generator is used directly.

Audio Output. A 500-ohm noninductive load must be connected across the audio output terminals (AUDIO OUT). Test equipment used to measure the audio output must have a high input impedance to prevent "loading" the audio output circuit.

Signal Generator Accuracy. In the following performance checks, a Hewlett-Packard Model 5216A Frequency Counter is used to determine the correct frequency settings of the Hewlett-Packard Model 606A Signal Generator.

TABLE 4-2. PERFORMANCE CHECKS

Step	Procedure	Normal Indication
	PRELIMINARY PROCEDURE	
1	Interconnect Cessna 800 ADF System and test equipment as shown in Figure 4-2.	None.
2	Prepare all test equipment for operation.	None.
3	Adjust input voltage to 27.5 volts.	Panel lamps lights.
4	Set antenna position simulator SELECTOR switch to L-521B/L-318G position.	None.
5	Set antenna position simulator or shielded room FUNCTION switch to LOOP-COMP position.	None.
6	Set AUDIO LEVEL SET control A3R15 (accessible through top dust cover) to maximum CW position.	None.
	RECEIVER MCW SENSITIVITY	
1	Set Hewlett-Packard Model 606A Signal Generator output to 70 μV at 220 kHz with 30 percent modulation at 1,000 Hz.	None.

TABLE 4-2. PERFORMANCE CHECKS (Continued)

Step	Procedure	Normal Indication
	RECEIVER MCW SENSITIVITY (Continued)	
2	Set ADF to 220 kHz and REC function.	(Depends on VOL control setting.)
3	Adjust VOL control for 2. 5-volt indication on Ballantine Model 300D VTVM.	300D indicates 2. 5 volts.
4	Remove modulation.	300D indicates a minimum of 6 dB below 2. 5 volts.
5	Repeat Steps 1 through 4, setting signal generator and ADF to the following frequencies: 380 kHz, 415 kHz, 800 kHz, 950 kHz, and 1, 600 kHz.	Same as Steps 2 through 4 for each frequency.
	RECEIVER CW SENSITIVITY	
1	Set Hewlett-Packard Model 606A Signal Generator output to 50 microvolts at 220 kHz with no modulation.	None.
2	Set ADF to 220 kHz and BFO function.	(Depends on VOL control setting.)
3	Adjust VOL control for 2. 5-volt indication on Ballantine Model 300D VTVM.	300D indicates 2. 5 volts.
4	Reduce signal generator output to zero.	300D indicates a minimum of 6 dB below 2. 5 volts.
5	Repeat steps 1 through 4, setting signal generator and ADF to the following frequencies: 380 kHz, 415 kHz, 800 kHz, 950 kHz, and 1, 600 kHz.	Same as steps 2 through 4 for each frequency.
	THRESHOLD SENSITIVITY (ADF)	
1	Set Hewlett-Packard Model 606A Signal Generator output to 100 microvolts at 220 kHz with 30 percent modulation at 1, 000 Hz.	None.
2	Set ADF to 220 kHz and ADF function.	(Depends on VOL control setting.)
3	Adjust VOL control for a 2. 5-volt indication on Ballantine Model 300D VTVM. Adjust goniometer-indicator HDG or VAR control to align 0° with index.	300D indicates 2. 5 volts and goniometer-indicator
4	Remove modulation.	300D indicates a minimum of 6 dB below 2. 5 volts.
5	Repeat Steps 1 through 4, setting signal generator and ADF to the following frequencies: 415 kHz and 950 kHz.	Same as Steps 1 through 4 for each frequency.
	COMPASS SENSITIVITY	
1	Set Hewlett-Packard Model 606A Signal Generator output to 50 microvolts at 220 kHz with no modulation.	None.
2	Set ADF to 220 kHz and ADF function. Adjust goniometer-indicator HDG or VAR control to align 0° with index.	Goniometer-indicator indicates 0° ±3°.
3	Push and then release antenna position simulator BEARING TEST switch.	Goniometer-indicator indicated 90° and then returns to 0°.

TABLE 4-2. PERFORMANCE CHECKS (Continued)

Step	Procedure	Normal Indication
	COMPASS SENSITIVITY - Continued	
4	Push in and hold TEST switch until goniometer-indicator indicates 175°. Release TEST switch and note time required for goniometer-indicator to return to 0° ±3°.	Goniometer-indicator pointer returns in less than 7 seconds.
5	Set ADF to REC function.	Goniometer-indicator indicates 90° ±3°.
6	Set ADF to ADF function.	Goniometer-indicator indicates 0° ±3°.
7	Repeat Steps 1, 2, and 3, with signal generator RF output level set at 100, 000 microvolts.	Goniometer-indicator indicates 0° ±3°.
8	Repeat Steps 1 through 7, setting signal generator and ADF to the following frequencies: 380 kHz, 415 kHz, 800 kHz, 950 kHz, and 1, 600 kHz.	Same as Steps 3 through 7 for each frequency.
	FREQUENCY INDICATOR ACCURACY	
1	Connect a Tektronix Probe Model 013-071 10X from A7-TP1 to Hewlett-Packard Model 5216A Frequency Counter.	None.
2	Set ADF to REC function and adjust VOL control to minimum output position.	None.
3	Set ADF to 220 kHz.	Frequency counter indicates 361 kHz ±36 Hz. *
4	Set ADF to 415 kHz.	Frequency counter indicates 556 kHz ±55 Hz. *
5	Set ADF to 800 kHz.	Frequency counter indicates 941 kHz ±94 Hz. *
6	Set ADF to 950 kHz.	Frequency counter indicates 1091 kHz ±174 Hz. *
7	Set ADF to 1, 600 kHz.	Frequency counter indicates 1741 kHz ±174 Hz. *
	AGC, POWER OUTPUT, AND MANUAL GAIN CONTROL	
1	Set Hewlett-Packard Model 606A Signal Generator to 100 microvolts at 370 kHz with 30 percent modulation at 1, 000 Hz.	None.
2	Set ADF to 370 kHz and REC function.	(Depends on VOL control setting.)
3	Adjust VOL control for a 2. 5-volt indication on Ballantine Model 300D VTVM.	300D indicates 2. 5 volts.
4	Set signal generator to RF output levels stated and note indications on 300D: 70, 1, 000, 10, 000, 100, 000, and 500, 000 microvolts. (Maintain the 100-microvolt level as the zero dB reference level.)	Maximum difference in 300D indications over signal input range is 7 dB.
5	Set signal generator RF output level to 100 microvolts and adjust VOL control fully clockwise. Observe audio output level.	Audio output level is 100 mW (7. 07 volts rms on 300D).

* This measures local oscillator frequency and provides an indication of receiver accuracy.

TABLE 4-2. PERFORMANCE CHECKS (Continued)

Step	Procedure	Normal Indication
	AGC, POWER OUTPUT, AND MANUAL GAIN CONTROL - Continued	
6	Set signal generator RF output level to 500, 000 microvolts and adjust VOL control fully counterclockwise. Observe audio output level.	Audio output level is 0. 01 volt maximum.
	SELECTIVITY	
1	Set Hewlett-Packard Model 606A Signal Generator output to 25 microvolts at 220 kHz with 30 percent modulation at 400 Hz.	None.
2	Set ADF to 220 kHz and REC function.	(Depends on VOL control setting.)
3	Adjust VOL control for a 2. 5-volt indication on Ballantine Model 300D VTVM. (Do not disturb this setting.)	300D indicates 2. 5 volts.
4	Set signal generator to 50 microvolts and adjust its frequency output between 210 and 230 kHz for a 2. 5-volt indication on the 300D at frequencies below and above 220 kHz.	Difference between low and high frequency output where 2. 5 volts is indicated on 300D is 4 kHz maximum.
5	Repeat Step 4 with the signal generator level set at 44, 250 microvolts.	Difference between low and high frequency output where 2. 5 volts is indicated on 300D is 12 kHz maximum.

4-4. TROUBLESHOOTING.

Table 4-3 lists the symptoms of some possible troubles which may be encountered during operation of the Cessna 800 ADF System, as well as their probable causes, and the procedures to be used to verify each probable cause. Voltage measurements are shown on Figure 5-1. Some voltage measurements can only be made by waveform analysis. In the case of waveform measurements, the time base for the oscilloscope is included. Schematic and wiring diagrams are shown in Section V.

TABLE 4-3. TROUBLESHOOTING CHART

Symptom	Probable Cause	Procedure
Set inoperative; complete silence in all operating modes throughout entire frequency range. No movement of goniometer-indicator pointer.	No input power.	Check fuse (3 amp) A4F1.
	Defective interconnection.	Check continuity of interconnecting wires.
	Defective ADF.	Remove ADF for bench test.
No audio output; equipment functions normally otherwise.	Defective audio circuit.	Make voltage reading at A3U2.
	Defective audio output transformer.	Check continuity of audio output
Noisy reception.	Interference from outside source.	Shut off aircraft engines and other equipment except ADF. Check reception on several stations.
	Poor ground connections.	Check all ground connections.

TABLE 4-3. TROUBLESHOOTING CHART - Continued

Symptom	Probable Cause	Procedure
Noisy reception (continued).	Defective sense antenna or sense antenna lead-in cable.	With ADF in REC function, check reception of known weak station.
	Defective loop antenna, loop cable assembly, goniometer, or goniometer cable.	With ADF in ADF function, check reception of both strong and known weak stations. Observe action of goniometer-indicator when checking.
Goniometer-indicator pointer moves when TEST switch is depressed, but does not move when stations are tuned in. Audio is normal with ADF in REC function.	Defective homing circuits, loop cable assembly, or goniometer cable.	Make voltage measurements at A1Q3, A2Q3, and A2Q4.
Normal operation from 200 kHz to 399 kHz. Weak or no reception from 400 kHz to 1, 699 kHz.	Defective band-switching transistors.	Check voltages at A1Q1, A1Q2, A2Q1, A2Q2, A2Q5, A2Q6, A2Q7, A2Q9, A2Q10, A2Q11, A2Q12, A7Q1, A7Q2, A7Q3 and A7Q4.
Normal operation from 200 kHz to 799 kHz. Weak or no reception from 800 kHz to 1, 699 kHz.	Defective band-switching transistors.	Check voltages at A1Q2, A2Q1, A2Q7, A2Q10, A2Q12, A7Q3, or A7Q4.
Goniometer-indicator pointer does not move when TEST switch is depressed. Audio is normal with ADF in REC function.	Defective servo circuits.	Check voltages at A4Q1 through A4Q6.
	Defective interconnecting wiring.	Check continuity of interconnecting wiring.
Goniometer-indicator reads 180° from correct station bearing.	Defective loop transformer A1T1, A1T2, or A1T3.	Remove ADF for bench test.
Note Erroneous directional information may be given during checks on the ground due to reflections from nearby buildings or power lines. Make suitable height checks to be sure trouble actually exists.	Incorrect interconnecting wiring at loop antenna, goniometer, or receiver cable.	Check continuity of wiring and check for correct wiring relative to loop and sense antenna locations.
	Loop antenna mounted incorrectly.	Remove loop cable assembly. Key on loop connector should face forward end of aircraft.
Goniometer-indicator pointer rotates more than 180° when aircraft is turned 90°.	Defective loop or receiver cable assembly.	Check continuity of cables.
In ADF function, goniometer-indicator pointer moves left when aircraft is turned left and right when aircraft is turned right.	Incorrect interconnecting wiring.	Check continuity of interconnecting wiring and check for correct wiring relative to loop and sense antenna locations.
Goniometer-indicator pointer rotates very slowly to station bearing during ADF operation or with TEST switch depressed.	Poor gain of servo amplifier stages.	Make voltage measurements at A4Q3 through A4Q6.
	Reference frequency oscillator off frequency.	Remove ADF for bench check. Check frequency of 160 Hz oscillator A4Q1 and A4Q2.
	Defective sense antenna.	Check sense antenna installation.

TABLE 4-3. TROUBLESHOOTING CHART - Continued

Symptom	Probable Cause	Procedure
Goniometer-indicator pointer rotates rapidly with no signal input (drift greater than 180° in 10 seconds).	Improper setting of balance control A2R12.	Make adjustments according to alignment procedure.
	Defective balanced modulator circuit.	Remove ADF for bench test. Make voltage measurements at A2Q3 and A2Q4.
Goniometer-indicator pointer shows station on strong signals only. (Pointer rotates normally with TEST switch depressed.)	Defective RF stage.	Remove ADF for bench test. Make voltage readings of RF circuit.

4-5. RECEIVER ALIGNMENT AND ADJUSTMENT.

The following alignment and adjustment procedures for the receiver assemblies are presented in a recommended sequence of performance if all assemblies are to be aligned and adjusted. However, except for the preliminary procedure, an individual assembly may be aligned or adjusted without necessarily performing any of the other procedures. The alignment or adjustment procedure for a specific assembly is identified by a paragraph heading preceding the applicable procedural steps.

The test equipment required for alignment and adjustment is listed in Table 4-1 and is shown in Figure 4-2. The signal source and audio output information contained in paragraph 4-3 is applicable. Alignment and adjustment points are identified on Figure 4-3 and the applicable illustrations in Section 5. After completing any alignment or adjustment, the applicable checks of Table 4-2 should be made to verify performance.

Preliminary Procedure.

Step 1. Remove dust cover from receiver, and remove inner cover to expose assemblies.

Step 2. Interconnect the units of the ADF System and the test equipment as shown in Figure 4-2.

Step 3. Prepare all test equipment for operation. Set antenna simulator FUNCTION switch to LOOP-COMP position and SELECTOR switch to L-521B/L-318G position.

Step 4. Adjust input power to 27.5 volts dc.

NOTE

Whenever power is applied to the receiver, check that the current drawn is approximately 1 ampere if the receiver panel lamps are connected, or approximately 0.6 ampere if the panel lamps are not connected.

Power Supply and Servo Amplifier Adjustment.

Step 1. Remove servo assembly A4 from receiver. Connect servo assembly to Test Extender Card ARC 41219. Install test extender card with servo assembly in receiver.

Step 2. Connect Hewlett-Packard Model 410C VTVM to junction of A4R11 and A4R26. (See Figure 5-5.)

Step 3. Set to ADF function. Adjust A4R27 until 410C reads 9.5±0.1 volts dc.

Step 4. Connect Tektronix Model 013-071 10X Oscilloscope Probe (vertical) from Tektronix Model 310A Oscilloscope to junction of A4R2 and A4C3. Connect Hewlett-Packard Model 200AB Audio Oscillator to horizontal terminals of oscilloscope.

Step 5. Adjust audio oscillator frequency until it is equal to frequency of servo oscillator as indicated on the oscilloscope by a stationary, circular pattern with one loop. This frequency must be between 150 Hz and 170 Hz. (Do not alter this audio oscillator frequency setting even though the oscilloscope pattern may vary due to oscillator drift.)

Step 6. Connect Ballantine Model 300D VTVM probe to A4-16 (alternative connection point is the dot, or positive, lead of A4C13).

Step 7. Set to REC function.

Step 8. Connect audio oscillator to A4-14. Maintain the audio oscillator frequency of step 5 and adjust the audio oscillator level to obtain 2 volts as indicated on the Ballantine Model 300D.

Step 9. Adjust A4R9 for a maximum reading on the 300D. If necessary, readjust audio oscillator level to obtain a 2 volt reading on the 300D.

Step 10. Adjust A4R15 for a maximum reading on the 300D. If necessary, readjust audio oscillator level to obtain a 2 volt reading on the 300D.

Step 11. Repeat steps 9 and 10 until no further improvement is observed.

Step 12. Disconnect audio oscillator and 300D. Remove test extender card with servo assembly, separate, and reinstall servo assembly in receiver.

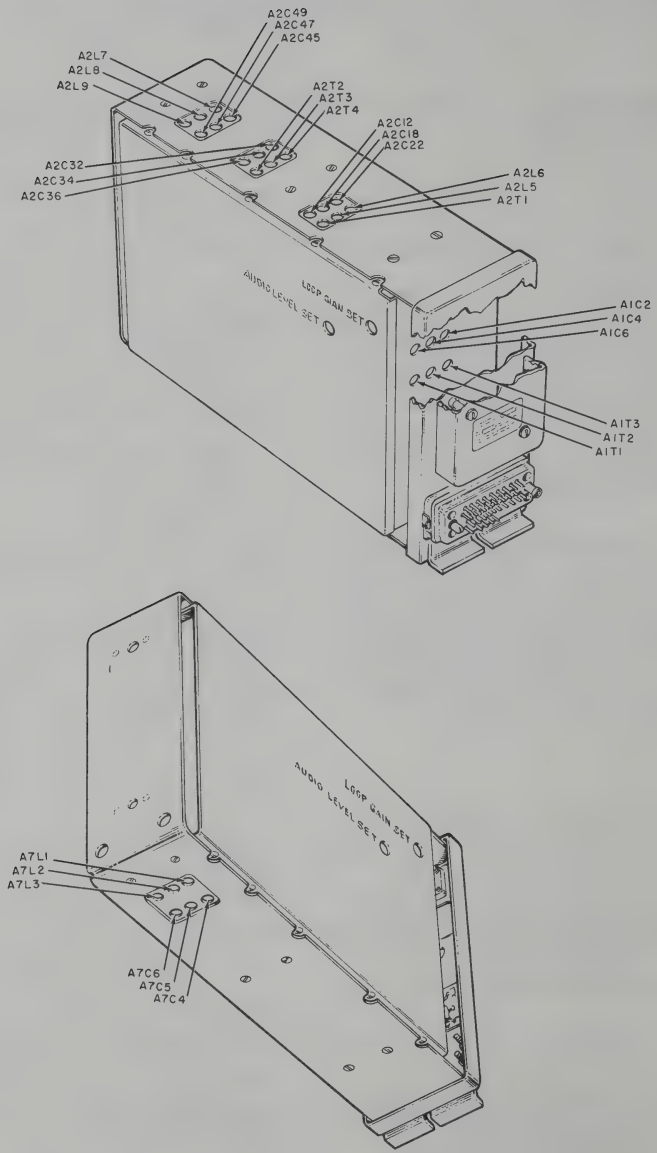


Figure 4-3. R-846A Receiver, Alignment Points

Phase Detector Adjustment.

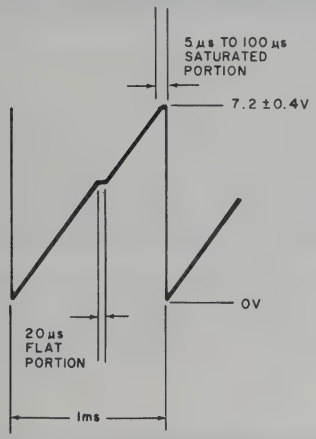
Step 1. Remove phase detector assembly A5 from receiver. Connect phase detector assembly to Test Extender Card ARC-41219. Install test extender card with phase detector assembly in receiver.

Step 2. Set ADF to 200 kHz and REC function.

Step 3. Set Tektronix Model 310A Oscilloscope to 0.1V/cm, 200 μs/cm, DC vertical coupling, and Trigger to internal negative.

Step 4. Connect Tektronix Model 013-071 10X Oscilloscope Probe from oscilloscope to A5TP1 (see Figure 5-6).

Step 5. Adjust A5R4 for maximum amplitude of the following waveform observed on the oscilloscope, and, if necessary, adjust A5R36 for a stable waveform.



Step 6. Set ADF to 399 kHz. Adjust A5R36 so that the flat portion of the waveform is 1.5 volts below the peak amplitude.

Step 7. Set ADF to 400 kHz. If necessary, adjust A4R47 for a stable waveform.

Step 8. Set ADF to 1,699 kHz. If necessary, adjust A4R47 for a stable waveform.

Step 9. Decrease frequency in 100 kHz decrements to 299 kHz. If necessary, adjust A5R36 or A5R47, or both, to obtain a stable waveform at each frequency setting.

Step 10. Increase frequency in 100 kHz increments to 1,699 kHz. If necessary, adjust A5R36 or A5R47, or both, to obtain a stable waveform at each frequency setting.

Step 11. Set ADF to 1,600 kHz. Decrease frequency in 100 kHz decrements to 200 kHz, and then increase frequency in 100 kHz increments to 1600 kHz. If necessary, adjust A5R36 or A5R47, or both, to obtain a stable waveform at each frequency setting.

Step 12. For each frequency setting ending in 00 and 99, turn power off and then on, and observe waveform. If necessary, adjust A5R36 or A5R47, or both, to obtain a stable waveform at each frequency setting.

Step 13. If either A5R36 or A5R47, or both, had to be adjusted in Steps 9, 10, 11, 12, to obtain a stable waveform at any frequency setting, repeat Steps 9, 10, 11, and 12 until no further adjustment is necessary.

Step 14. Disconnect oscilloscope. Remove test extender card with phase detector assembly, separate, and reinstall phase detector assembly in receiver.

IF Alignment and Adjustment.

Step 1. Remove IF assembly A3 from receiver. Connect IF assembly to Test Extender Card ARC-41219. Install test extender card with IF assembly in receiver.

Step 2. Using Hewlett-Packard Model 5216A Frequency Counter, set Hewlett-Packard Model 606A Signal Generator to 141 kHz.

Step 3. Set signal generator RF level to zero with 30 percent modulation at 1000 Hz. Connect signal generator through a series-connected 0.68-microfarad capacitor to junction of A3R1 and A3C1.

Step 4. Connect Hewlett-Packard Model 410C VTVM to A3C30 and chassis ground. Set ADF to REC function. Adjust A3R28 for 5.4 volts dc. Disconnect 410C.

Step 5. With Ballantine Model 300D VTVM connected across 500-ohm load, adjust signal generator to 50 microvolts, and adjust A3T1 for maximum audio output as indicated on 300D.

Step 6. Connect 410C to junction of A3R14 and A3CR3 and chassis ground.

Step 7. Adjust signal generator to 1000-microvolt output, and adjust A3R36 for 410C reading of 6 volts dc.

Step 8. Disconnect 410C and signal generator. Remove test extender card with IF assembly, separate, and reinstall IF assembly in receiver.

VCO Alignment.

Step 1. Connect Hewlett-Packard Model 410C VTVM to A5TP3. Set ADF to REC function.

Step 2. With no RF signal, set frequency to 800 kHz and adjust A7L1 for 1.5 volts dc.

Step 3. Set frequency to 1,699 kHz and adjust A7C4 for 6.5 volts dc.

Step 4. Repeat Steps 2 and 3 until the two voltages are exactly 1.5 volts dc and 6.5 volts dc, respectively.

Step 5. Set ADF to 400 kHz and adjust A7L2 for 1.5 volts dc.

Step 6. Set frequency to 799 kHz and adjust A7C5 for 6.0 volts dc.

Step 7. Repeat Steps 5 and 6 until the two voltages are exactly 1.5 volts dc and 6.0 volts dc, respectively.

Step 8. Set frequency to 200 kHz and adjust A7L3 for 1.5 volts dc.

Step 9. Set frequency to 399 kHz and adjust A7C6 for 6.0 volts dc.

Step 10. Repeat Steps 8 and 9 until the two

voltages are exactly 1.5 volts dc and 6.0 volts dc, respectively.

RF Alignment and Adjustment.

Step 1. Connect Hewlett-Packard Model 410C VTVM to highside of A3C30 (lead nearest front of assembly) and chassis ground.

Step 2. Set ADF to 800 kHz and REC function.

Step 3. Using Hewlett-Packard Model 5216A Frequency Counter, set Hewlett-Packard Model 606A Signal Generator to exactly 800 kHz with no modulation. Adjust RF output of signal generator to produce 4.0 volts dc, as read on 410C. Adjust A2L7, A2T4, and A2L6 for a null indication on the 410C.

NOTE

Throughout this procedure, use the frequency counter to set the frequency of the signal generator, then disconnect the frequency counter.

Step 4. Set signal generator to 1699 kHz, adjust output for 4.0 volts dc, and adjust A2C45, A2C32, and A2C22 for a null indication on the 410C.

Step 5. Repeat Steps 3 and 4 until no further improvement is observed.

Step 6. Set signal generator to 400 kHz, adjust output for 4.0 volts dc, and adjust A2L8, A2T3, and A2L5 for a null indication on the 410C.

Step 7. Set signal generator to 799 kHz, adjust output for 4.0 volts dc, and adjust A2C47, A3C34, and A2C18 for a null indication on the 410C.

Step 8. Repeat Steps 6 and 7 until no further improvement is observed.

Step 9. Set signal generator to 200 kHz, adjust output for 4.0 volts dc, and adjust A2L9, A2T2, and A2T1 for a null indication on the 410C.

Step 10. Set signal generator to 399 kHz, adjust output for 4.0 volts dc, and adjust A2C49, A2C36, and A2C12 for a null indication on the 410C.

Step 11. Repeat Steps 9 and 10 until no further improvement is observed.

Balanced Modulator Adjustment.

Step 1. Disconnect sense antenna from antenna simulator.

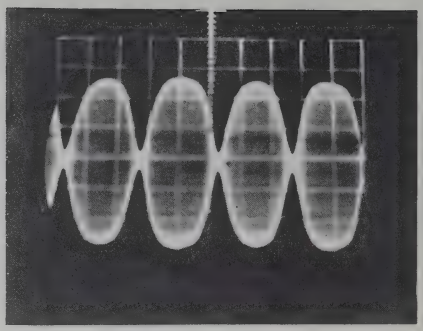
Step 2. Disconnect signal generator from antenna simulator and connect it to A2P21 (A2P21 need not be disconnected).

Step 3. Connect Tektronix Model 013-071 10X Oscilloscope Probe from Tektronix Model 310A Oscilloscope through a serires-connected 220,000-ohm resistor to pin 1 of A3T1.

Step 4. Using Hewlett-Packard Model 5216A Frequency Counter, set Hewlett-Packard Model 606A Signal Generator to 200 kHz. Set ADF to 200 kHz and ADF function. Set output of signal generator to 5,000 microvolts with no modulation.

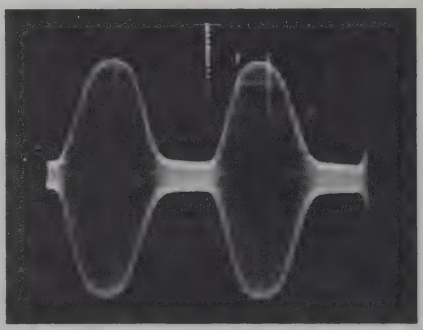
Step 5. Synchronize the oscilloscope to obtain a waveform similar to that shown and adjust A2R12 for equal amplitude of all cycles.

Step 6. Disconnect signal generator from A2P21 and reconnect it to antenna simulator.



Step 7. Remove dust cover from goniometer-indicator. With TEST switch, slew goniometer-indicator pointer to 90-degree position, stop rotation at this point with finger-pressure applied to gear train, and attach a small alligator clip, or similar device, to the gear to maintain pointer in this position.

Step 8. Reconnect sense antenna to antenna simulator. The waveform displayed should now be half the frequency of the waveform displayed previously, as follows:



Loop Alignment and Adjustment.

Step 1. Using Hewlett-Packard Model 5216A Frequency Counter, set Hewlett-Packard Model 606A Signal Generator to 800 kHz. Set ADF to 800 kHz and ADF function. Set output of signal generator to 5, 000 microvolts with no modulation.

Step 2. Connect Tektronix Model 013-071 10X Oscilloscope Probe from Tektronix Model 310A Oscilloscope through a series-connected 220, 000-ohm resistor to pin 1 of A3T1. Oscilloscope should display waveform similar to that shown in Step 8 of the procedure for adjusting the balanced modulator.

Step 3. Adjust A1T3 for maximum modulator of the waveform displayed.

Step 4. Set signal generator and ADF to 1699 kHz and adjust A1C2 for maximum modulation.

Step 5. Repeat adjustment of A1T3 at 800 kHz and A1C2 at 1699 kHz until no further improvement is observed.

Step 6. Set signal generator and ADF to 400 kHz and adjust A1T2 for maximum modulation.

Step 7. Set signal generator and ADF to 799 kHz and adjust A1C4 for maximum modulation.

Step 8. Repeat Steps 6 and 7 until no further improvement is observed.

Step 9. Set signal generator and ADF to 200 kHz and adjust A1T1 for maximum modulation.

Step 10. Set signal generator and ADF to 399 kHz and adjust A1C6 for maximum modulation.

Step 11. Repeat Steps 9 and 10 until no further improvement is observed.

4-6. GONIOMETER-INDICATOR ALIGNMENT AND ADJUSTMENT.

IN-346C and IN-346D. If the IN-346C or IN-346D has been disassembled, the unit must be aligned and adjusted before reassembly is completed. Reassemble the unit except for the cover, and do not secure the hinges, rear plate on which the connectors are mounted. Refer to Figure 4-5 and proceed as follows:

Step 1. Set all compensation adjustment screws to their maximum counterclockwise positions. Using VAR control, set 0° on dial under index. Using goniometer drive gear, set cam follower over 45° compensation adjustment screw. Note pointer indication.

Step 2. Set 45° compensation adjustment screw to its maximum clockwise position.

CAUTION

To prevent damage to the cam follower track, it may be necessary to adjust adjacent compensation adjustment screws so that the cam follower track is sloped and not bent abruptly.

Note pointer indication. Compute total range of compensation by obtaining difference between pointer reading of this step and Step 1. Divide difference (at least 50°) by 2 and add resultant figure to the lower of the two pointer indications. This figure is the midrange point of the 45° compensation adjustment screw.

Step 3. Set 45° compensation adjustment screw to its midrange point, as indicated by pointer.

Step 4. If necessary, position cam follower over 45° compensation adjustment screw; then, align fiducial mark and 45° position on goniometer dial by loosening screws securing fiducial bracket in position, adjusting fiducial bracket, and then tightening screws.

Step 5. Interconnect goniometer-indicator and test equipment as shown in Figure 4-4.

Step 6. Set Hewlett-Packard Model 606A Signal Generator output for 2 volts at 100 kHz. Adjust Tektronix Model 310A Oscilloscope for suitable presentation.

Step 7. Manually rotate goniometer drive gear until Boonton Electronics Model 91DA RF Voltmeter indicates a null and a horizontal line is observed on 310A.

NOTE

There are two null positions; at the correct null point, pointer and waveform rotate in the same direction.

Step 8. Manually restrict movement of gear train, loosen goniometer attaching screws and adjust goniometer for exact null as indicated by minimum voltage reading on Model 91DA. Retighten goniometer attaching screws.

Step 9. Loosen setscrews securing center spring gear and align 45° mark on goniometer dial with fiducial mark. Tighten setsecrews.

Step 10. Loosen setscrews securing pointer adjustment gear and align pointer with 45° index. Tighten setscrews.

Step 11. If necessary, repeat Steps 7 through 10 until maximum accuracy of alignment is obtained.

Step 12. Rotate goniometer drive gear until 75° mark on goniometer dial is aligned with fiducial. Adjust 75° compensation adjustment screw until pointer indicates 75°. For each remaining compensation point, adjust the related compensation screw for an equivalent pointer indication.

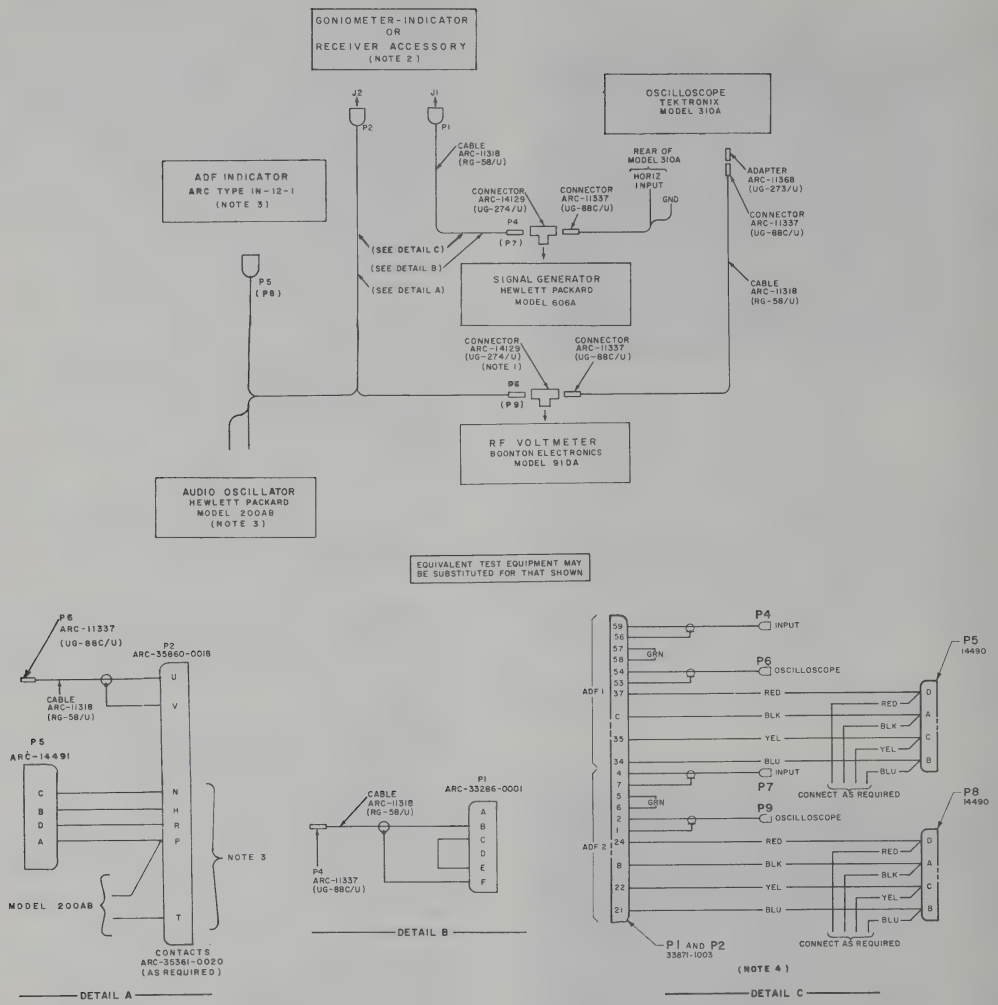
Step 13. For IN-346D, set Hewlett-Packard Model 200AB Audio Oscillator for output of 26 volts at 400 Hz.

Step 14. Restrict movement of pointer adjustment gear, loosen setscrews in synchro transmitter gear, and rotate synchro spring gear until the indication of the IN-12-1 ADF Indicator, or other secondary ADF indicator, is the same as the indication of the IN-346D. Tighten setscrews in drive gear.

Step 15. Check that rotation of indicator pointers of the IN-346D and other ADF indicator is the same.

Step 16. Disconnect and remove goniometer-indicator from test set-up, and adjust pointer-stow switch as follows:

Step 17. Rotate the VAR knob to align dial 0 with index.



NOTES:

1. USE BNC ADAPTER SUPPLIED WITH MODEL 91DA.
2. GONIOMETER-INDICATOR OR RECEIVER ACCESSORY MUST BE WIRED FOR TOP SENSE ANTENNA AND BOTTOM LOOP ANTENNA LOCATIONS.
3. USED ONLY FOR ALIGNMENT OF SYNCHRO TRANSMITTER (IN-346B, IN-346D, OR RA-346 ( ).
4. USED ONLY FOR ALIGNMENT OF SYNCHRO TRANSMITTER RA-346 ( ).

Figure 4-4. Bench Test Interconnection Diagram for Alignment of Goniometer-Indicators

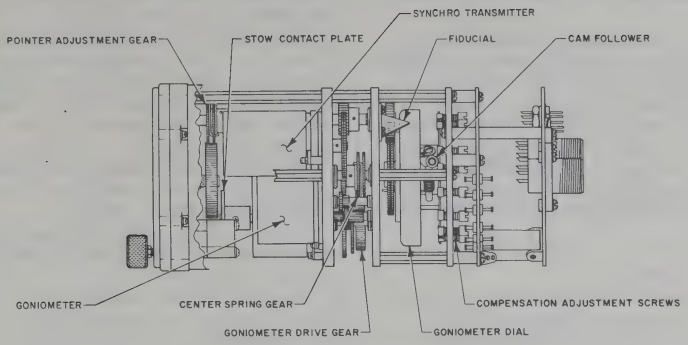


Figure 4-5. IN-346C and IN-346D Goniometer-Indicator, Alignment Points

Step 18. Rotate the goniometer gear until the pointer indicates 90°.

Step 19. Loosen two setscrews (67, Figure 6-2) in contact plate (66) and rotate contact plate until center of open area on contact plate is under the contacts. Tighten setscrews.

Step 20. Complete reassembly of goniometer-indicator.

4-7. RECEIVER ACCESSORY ALIGNMENT AND ADJUSTMENT.

If the receiver accessory has been disassembled, the following procedure must be performed. A test cable must be fabricated for interconnecting the equipment as shown in Figure 4-4. Alignment points for the receiver accessory are shown in Figure 4-6.

Step 1. Interconnect equipment as shown in Figure 4-4.

NOTE

For RA-346B, depending on the assembly to be aligned, make connections for either ADF 1 or ADF 2 operation. If both assemblies are to be aligned, perform procedure for each assembly.

Step 2. Set Hewlett-Packard Model 606A Signal Generator output for 2 volts at 100 kHz, unmodulated. Set Hewlett-Packard Model 200AB Audio Oscillator output for 13 volts at 100 Hz.

Step 3. Set all compensation adjustment screws to their midpositions. Using VAR control, set 0° on

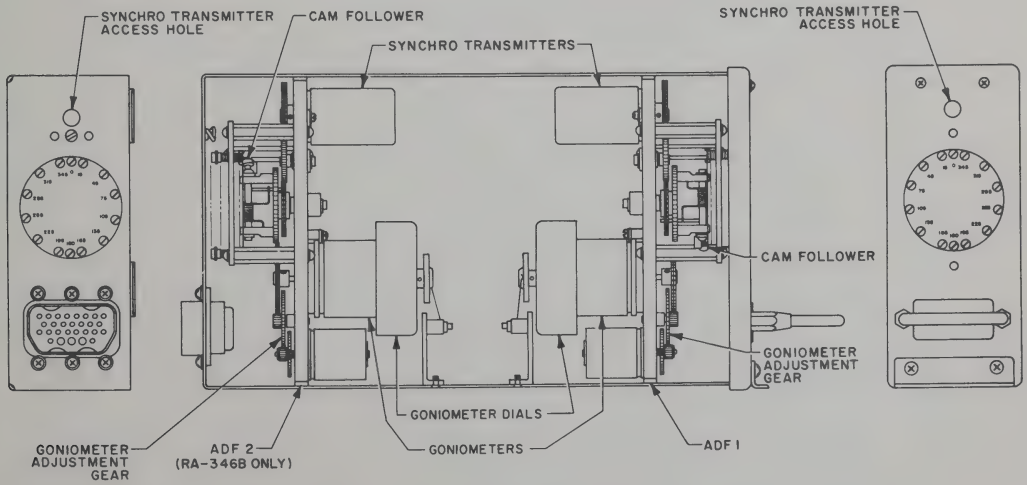


Figure 4-6. RA-346A and RA-346B Receiver Accessory, Alignment Points

dial under index on ADF indicator. Using goniometer adjustment gear, set cam follower over 45° adjustment screw.

Step 4. Set 45° compensation adjustment screw to maximum counterclockwise position and note pointer reading of ADF indicator. Set 45° screw to maximum clockwise position and note pointer reading. Compute total range (55° minimum) of compensation by obtaining the difference between counterclockwise and clockwise pointer readings. Divide difference by 2 and add resultant figure to clockwise pointer reading. This figure is midrange of 45° compensation adjustment screw.

CAUTION

To prevent damage to the cam follower track, it may be necessary to adjust the adjacent compensation adjustment screws so that the cam follower track is sloped and not bent abruptly.

Step 5. Set 45° compensation adjustment screw to its midrange position.

Step 6. Rotate goniometer adjustment gear until horizontal line is observed on Tektronix Model 310A Oscilloscope. This position is a null position, of which there are two. To determine correct null position, rotate goniometer adjustment gear and observe horizontal line; it should rotate in same direction as pointer of ADF indicator.

Step 7. Observe Boonton Electronics Model 91DA R-F Voltmeter and readjust for null.

Step 8. Apply firm finger pressure to gear train to hold gear train steady and loosen setscrews of goniometer dial. Position dial so that 45° mark is aligned with fiducial. Tighten setscrews.

Step 9. While holding goniometer dial in 45° position, loosen setscrews in hub of gear attached to goniometer. Disengage and position cam follower opposite the 45° adjustment screw. Engage gear and tighten hub setscrews.

Step 10. While holding goniometer dial in 45° position, loosen setscrews in hub of gear attached to synchro transmitter shaft.

Step 11. Rotate shaft of synchro transmitter until pointer of ADF indicator is positioned at 45°. Tighten setscrews.

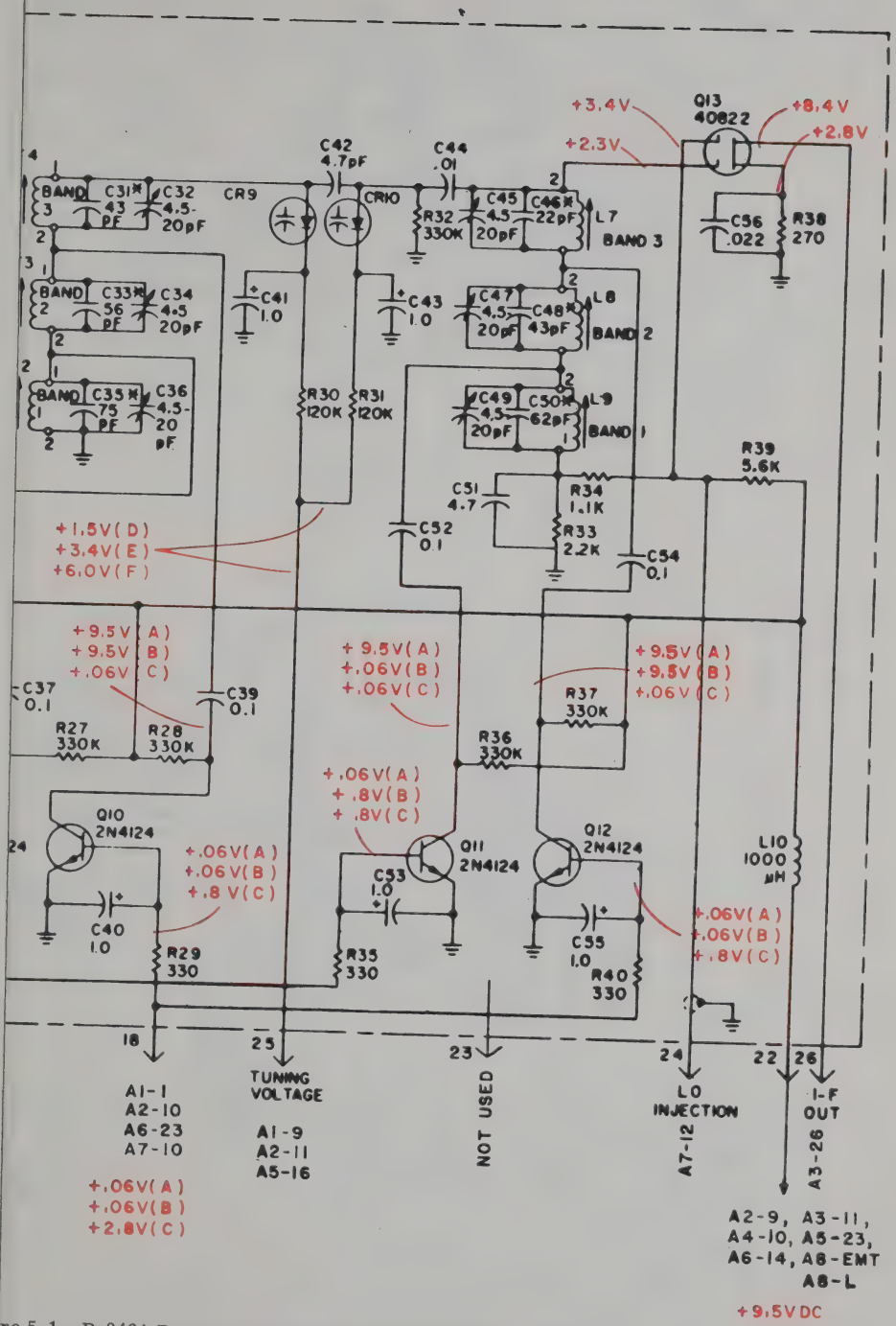
Step 12. Rotate goniometer to each compensation point and adjust compensation screw until pointer of ADF indicator reads the same as the goniometer dial. Do not force adjustment screws; if correct adjustment cannot be obtained, continue with next adjustment screw, and then return. Do not readjust 45° compensation screw. Verify that pointer of ADF indicator nulls at 0°.

Step 13. After completion of alignment, adjust stow switch by loosening two setscrews (13 or 15, Figure 6-3) and rotate contact plate assembly (12 or 14) so that the center of the open space is over the contact when the indicator pointer is at the 90° mark and the 0° position bearing indicator is at the index mark.

Step 14. Tighten setscrews.

SECTION V

DIAGRAMS



re 5-1. R-846A Receiver, Schematic Diagram (Sheet 1 of 4)

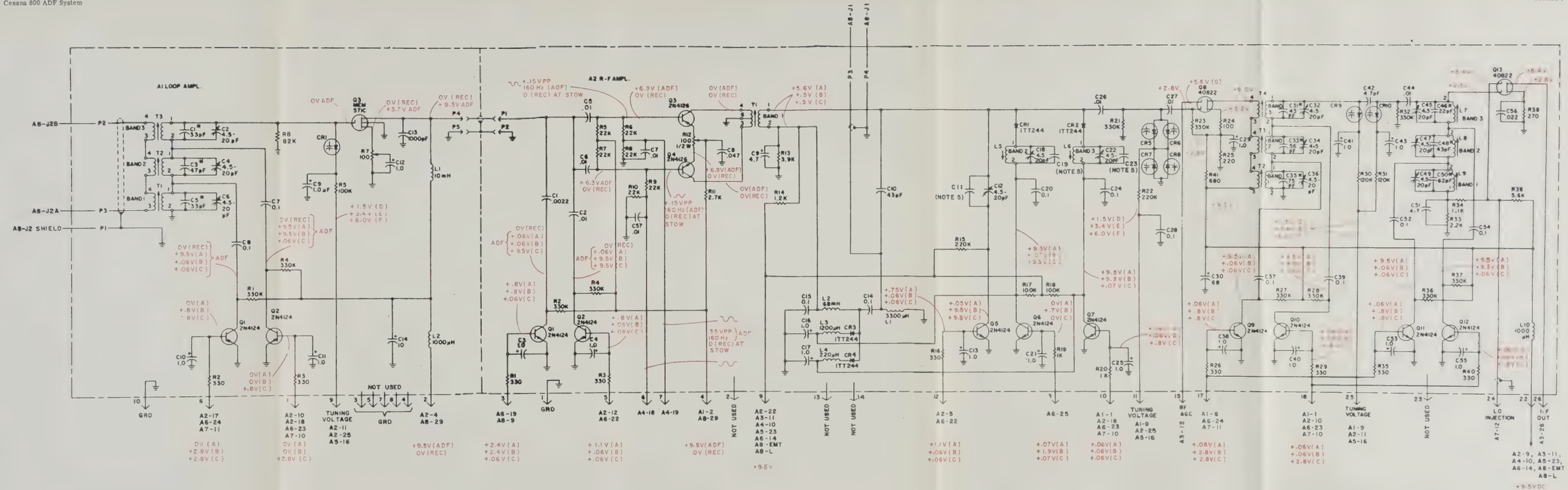
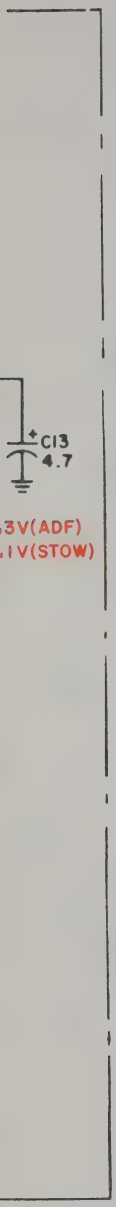
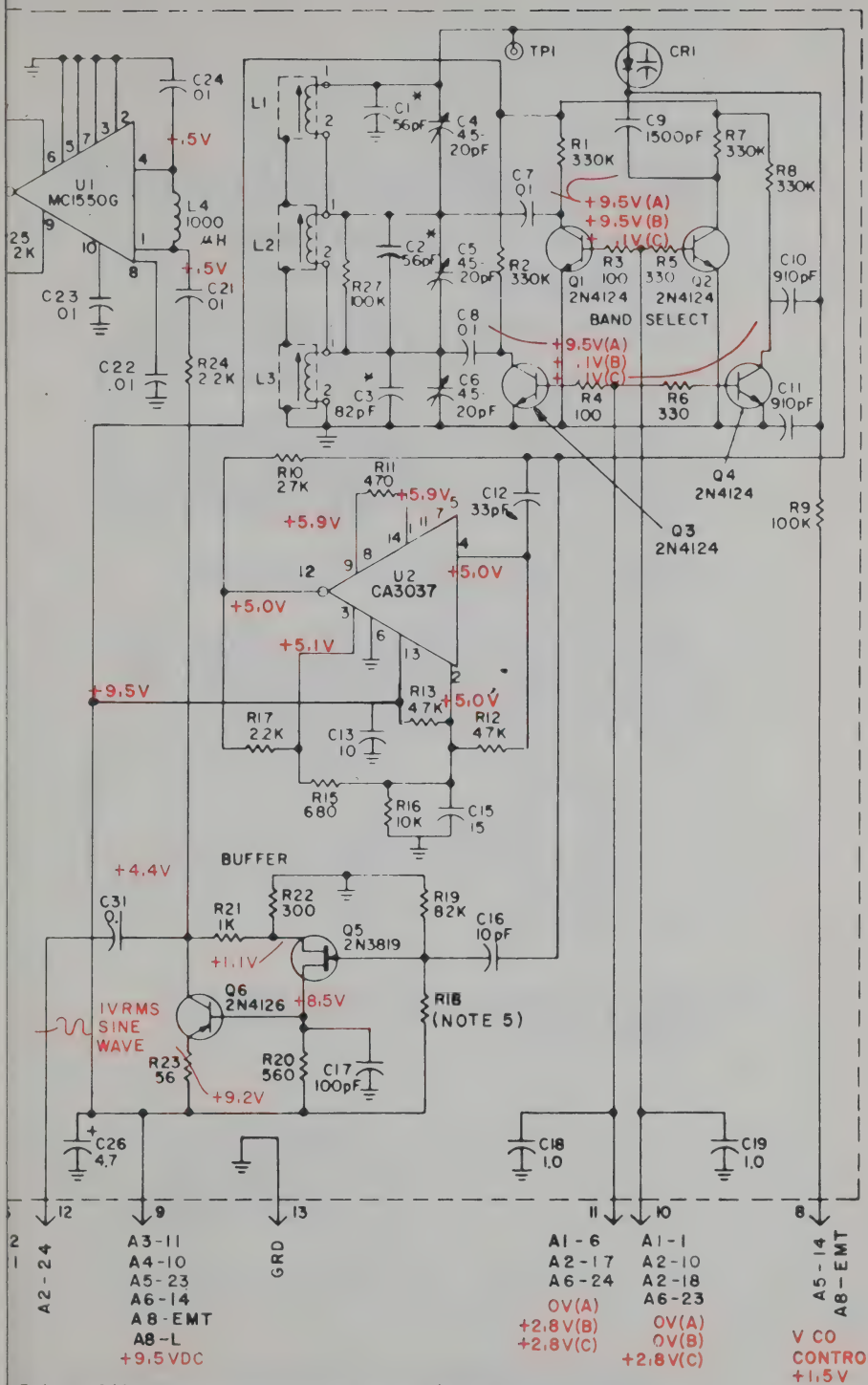


Figure 5-1. R-846A Receiver, Schematic Diagram (Sheet 1 of 4)


C13
4.7
.3V(ADF)
.1V(STOW)



5-1. R-846A Receiver, Schematic Diagram (Sheet 3 of 4)

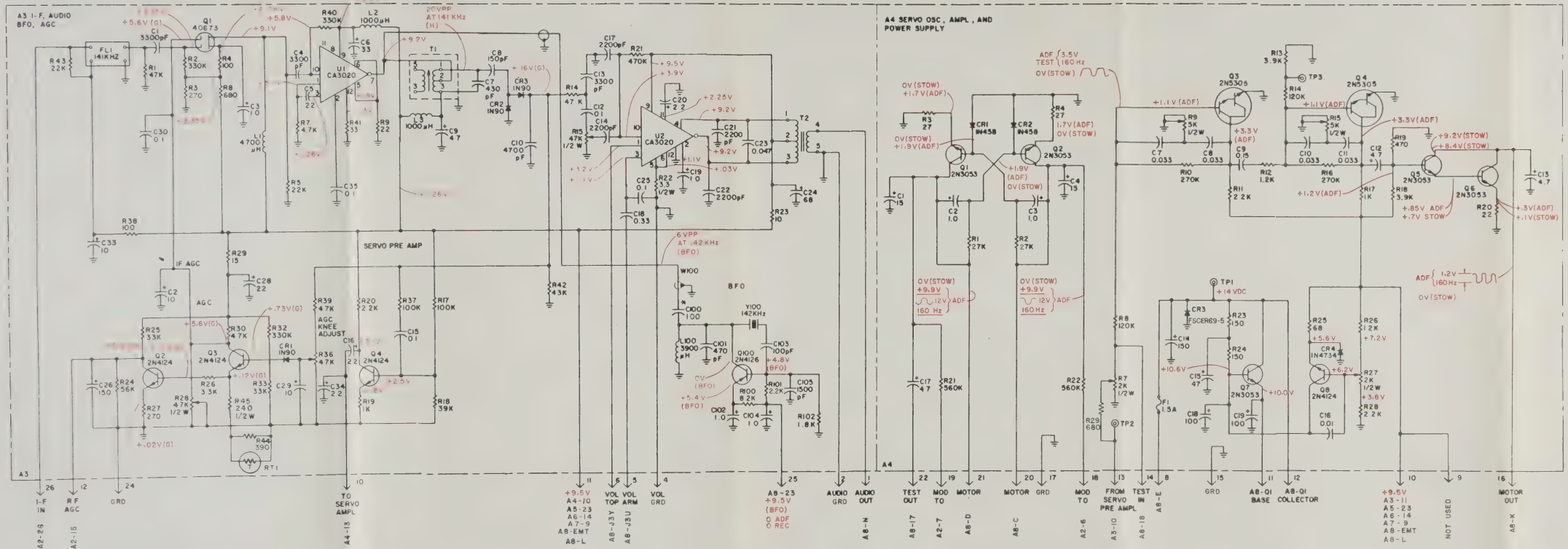


Figure 5-1. R-846A Receiver, Schematic Diagram (Sheet 2 of 4)

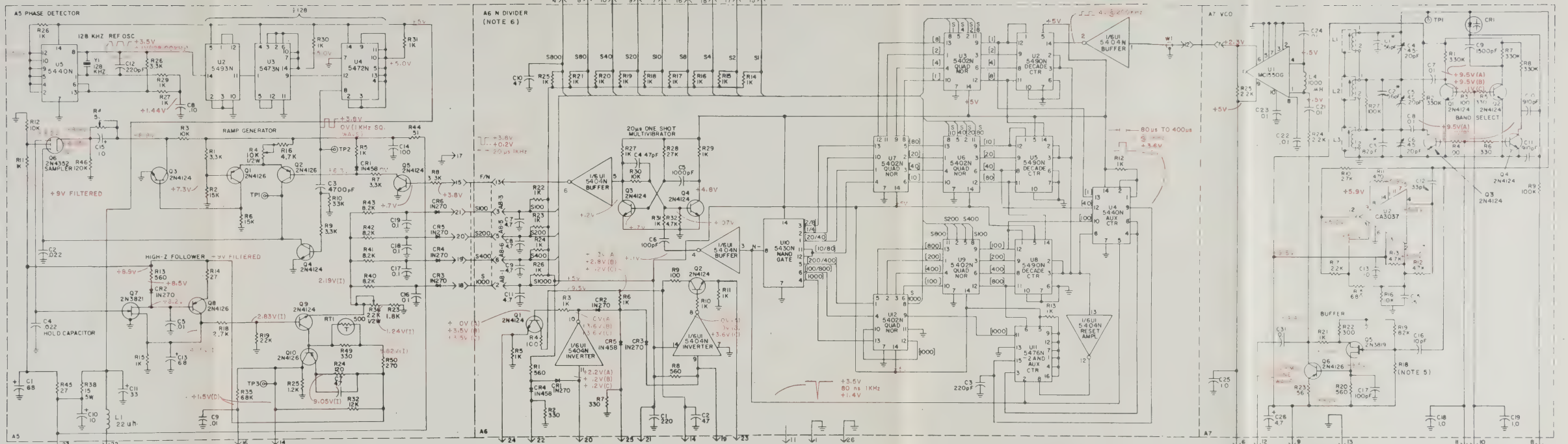
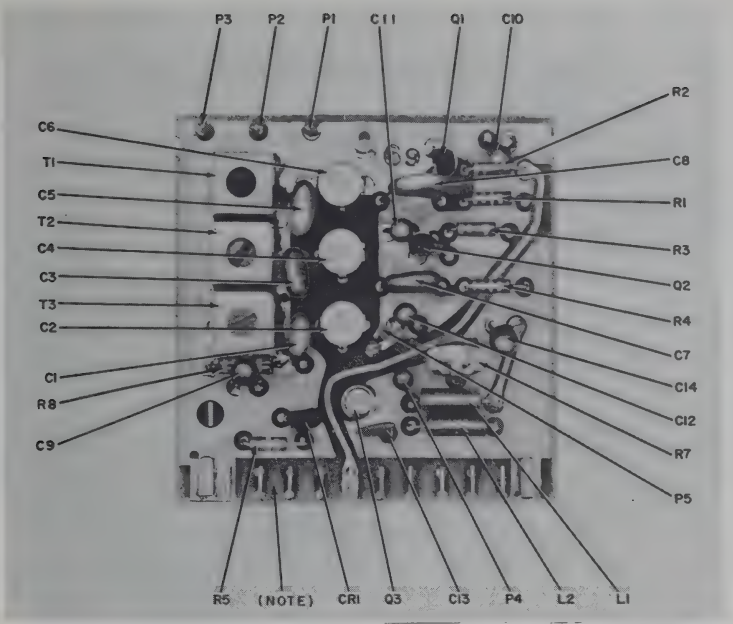
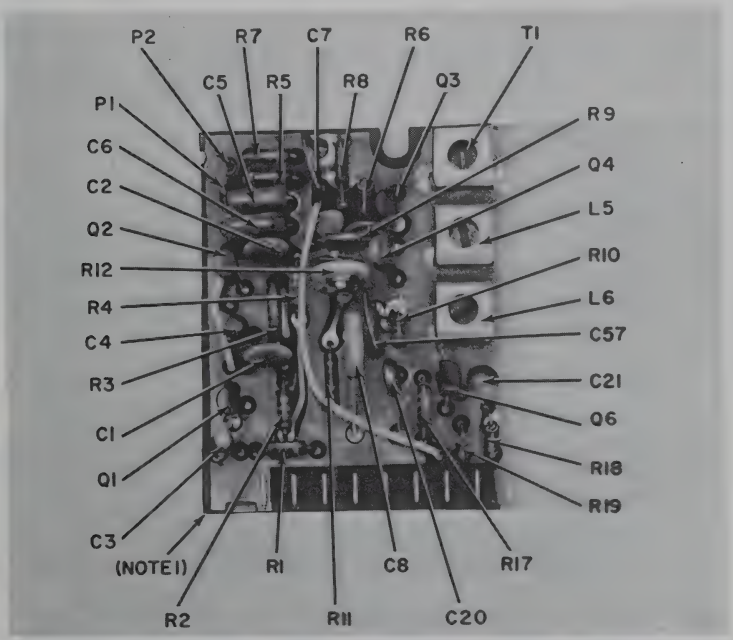


Figure 5-1. R-846A Receiver, Schematic Diagram (Sheet 3 of 4)



NOTE: FROM LEFT TO RIGHT, CONTACTS ARE RELATED TO NUMBERS 10 THROUGH 1 PRINTED ON UNDERSIDE OF MOTHER BOARD A8.

Figure 5-2. R-846A Receiver, Loop Amplifier A1, Part Locations



NOTE: FROM LEFT TO RIGHT, CONTACTS ARE RELATED TO NUMBERS 1 THROUGH 15, 17, 18 and 22 THROUGH 26 PRINTED ON UNDERSIDE OF MOTHER BOARD A8.

Figure 5-3. R-846A Receiver, RF Amplifier A2 Part Locations (Sheet 1 of 3)

NOTES:

1. REFERENCE DESIGNATIONS ARE ABBREVIATED. FOR COMPLETE IDENTIFICATION, PREFIX REFERENCE DESIGNATION WITH ASSEMBLY DESIGNATION, FOR EXAMPLE: A2C1.
2. FOR PART LOCATION DIAGRAMS, SEE FIGURES 5-2 THRU 5-8.
3. CAPACITOR VALUES ARE IN MICROFARADS (μF) UNLESS OTHERWISE INDICATED.
4. CAPACITORS MARKED WITH AN ASTERISK (FOR EXAMPLE, A1C1*) ARE SELECTED; VALUE SHOWN IS NOMINAL.
5. VALUE OF A2C11, A2C19, A2C23 SELECTED DURING FINAL FACTORY TESTING.
6. NUMBERS ENCLOSED WITH BRACKETS (FOR EXAMPLE, [80]) INDICATE BINARY CODED DECIMAL (BCD) STATES OF THE COUNTER. NUMBERS PRECEDED BY AN S (FOR EXAMPLE, S200) INDICATE SWITCHING (LOGIC) LINES USED TO SELECT BCD STATE TO DETERMINE RECEIVER OPERATING FREQUENCY.
7. TERMINAL DESIGNATIONS, BOTH ALPHABETICAL AND NUMERICAL, SHOWN FOR ASSEMBLY A8 ARE MARKED ON THE PRINTED CIRCUIT BOARD.
8. VOLTAGE MEASUREMENTS SHOWN IN RED ARE POSITIVE DC UNLESS OTHERWISE INDICATED AND ARE MEASURED WITH HEWLETT-PACKARD MODEL 410C VTVM, OR EQUIVALENT, CONNECTED WITH RESPECT TO CHASSIS GROUND. MEASUREMENT CONDITIONS NOTED BY ALPHABETICAL SUFFIX IN PARENTHESES ARE AS FOLLOWS:
   - (A) 200-399 kHz
   - (B) 400-799 kHz
   - (C) 800-1, 599 kHz
   - (D) 200, 400, 800 kHz (TYPICAL)
   - (E) 300, 600, 1, 200 kHz (TYPICAL)
   - (F) 399, 799, 1, 640 kHz (TYPICAL)
   - (G) NO SIGNAL
   - (H) INPUT SIGNAL = 1, 000 μV/M
   - (I) 200 kHz

NOTE: FROM LEFT TO RIGHT, CONTACTS ARE RELATED TO NUMBERS 10 THROUGH 1 PRINTED ON UNDERSIDE OF MOTHER BOARD A8.

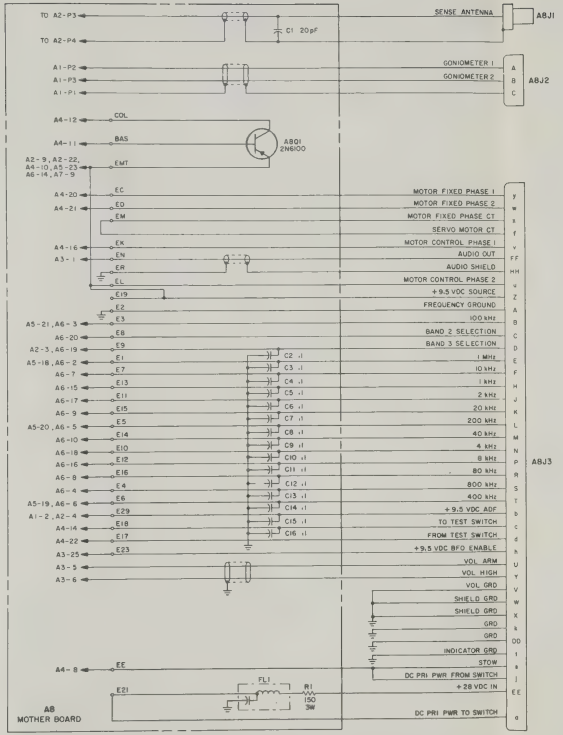
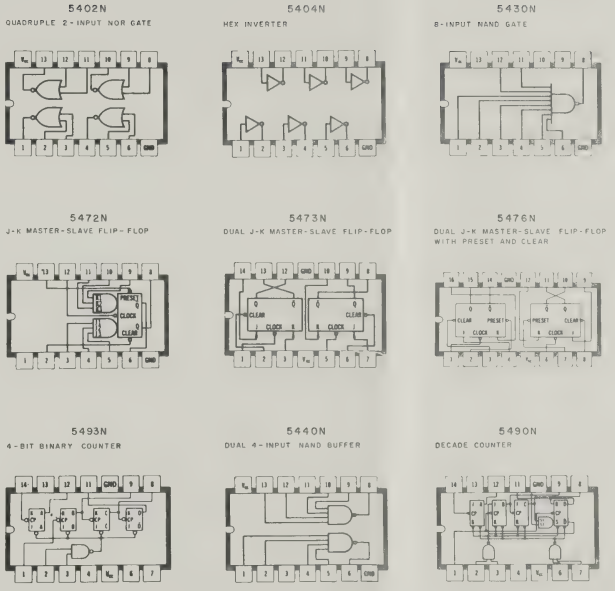


Figure 5-1. R-846A Receiver, Schematic Diagram (Sheet 4 of 4)



NOTES:

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3. CAPACITOR VALUES ARE IN MICROFARADS (μF) UNLESS OTHERWISE INDICATED.
4. CAPACITORS MARKED WITH AN ASTERISK (FOR EXAMPLE, A1C1*) ARE SELECTED; VALUE SHOWN IS NOMINAL.
5. VALUE OF A2C11, A2C19, A2C23 SELECTED DURING FINAL FACTORY TESTING.
6. NUMBERS ENCLOSED WITH BRACKETS (FOR EXAMPLE, [80]) INDICATE BINARY CODED DECIMAL (BCD) STATES OF THE COUNTER. NUMBERS PRECEDED BY AN S (FOR EXAMPLE, S200) INDICATE SWITCHING (LOGIC) LINES USED TO SELECT BCD STATE TO DETERMINE RECEIVER OPERATING FREQUENCY.
7. TERMINAL DESIGNATIONS, BOTH ALPHABETICAL AND NUMERICAL, SHOWN FOR ASSEMBLY A8 ARE MARKED ON THE PRINTED CIRCUIT BOARD.
8. VOLTAGE MEASUREMENTS SHOWN IN RED ARE POSITIVE DC UNLESS OTHERWISE INDICATED AND ARE MEASURED WITH HEWLETT-PACKARD MODEL 410C VTVM, OR EQUIVALENT, CONNECTED WITH RESPECT TO CHASSIS GROUND. MEASUREMENT CONDITIONS NOTED BY ALPHABETICAL SUFFIX IN PARENTHESES ARE AS FOLLOWS:

   (A) 200-399 kHz
   (B) 400-799 kHz
   (C) 800-1, 699 kHz
   (D) 200, 400, 800 kHz (TYPICAL)
   (E) 300, 600, 1, 200 kHz (TYPICAL)
   (F) 399, 799, 1, 640 kHz (TYPICAL)
   (G) NO SIGNAL
   (H) INPUT SIGNAL = 1, 000 μV/M
   (I) 200 kHz

NOTE: FROM LEFT TO RIGHT, CONTACTS ARE RELATED TO NUMBERS 10 THROUGH 1 PRINTED ON UNDERSIDE OF MOTHER BOARD A8.

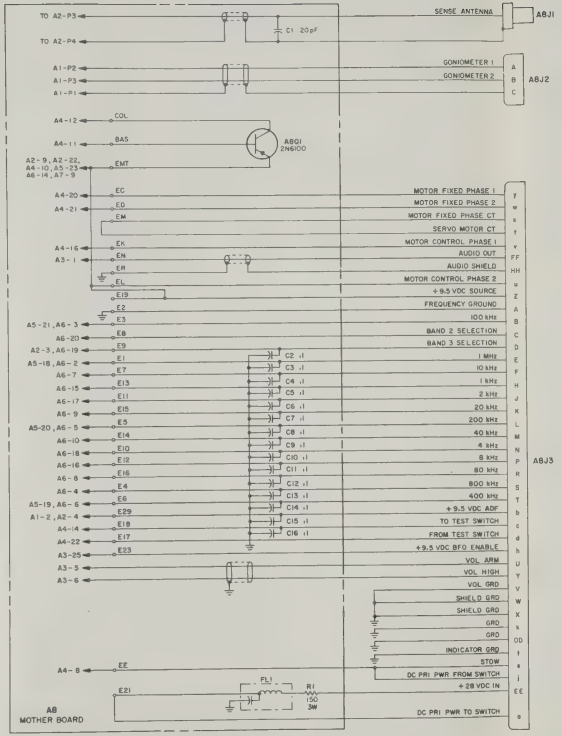
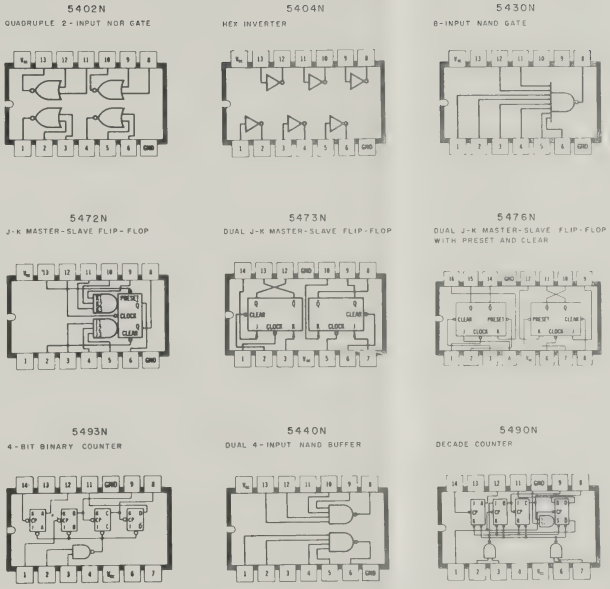
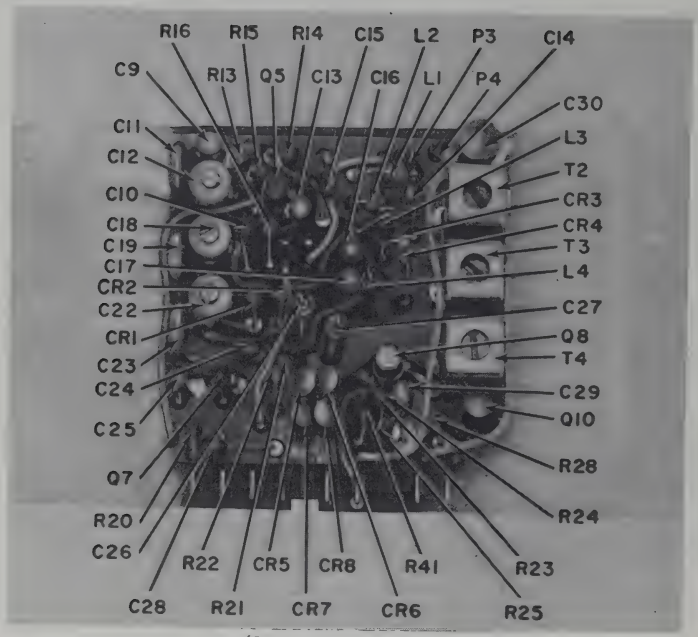


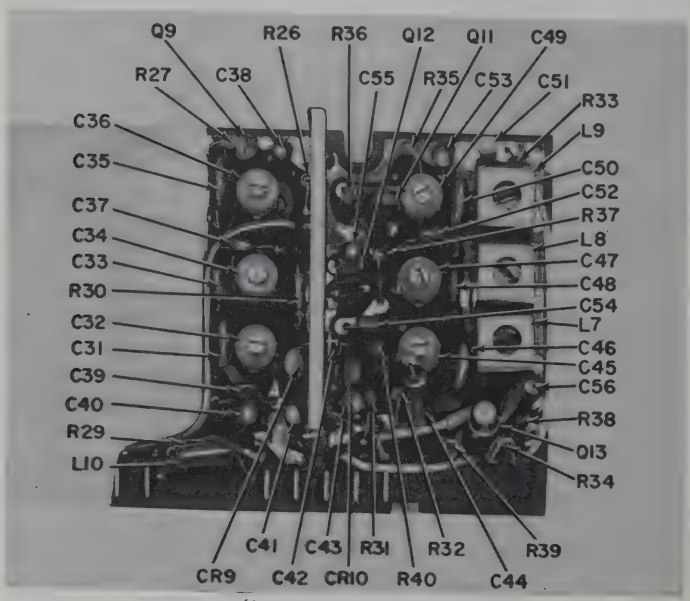
Figure 5-1. R-846A Receiver, Schematic Diagram (Sheet 4 of 4)





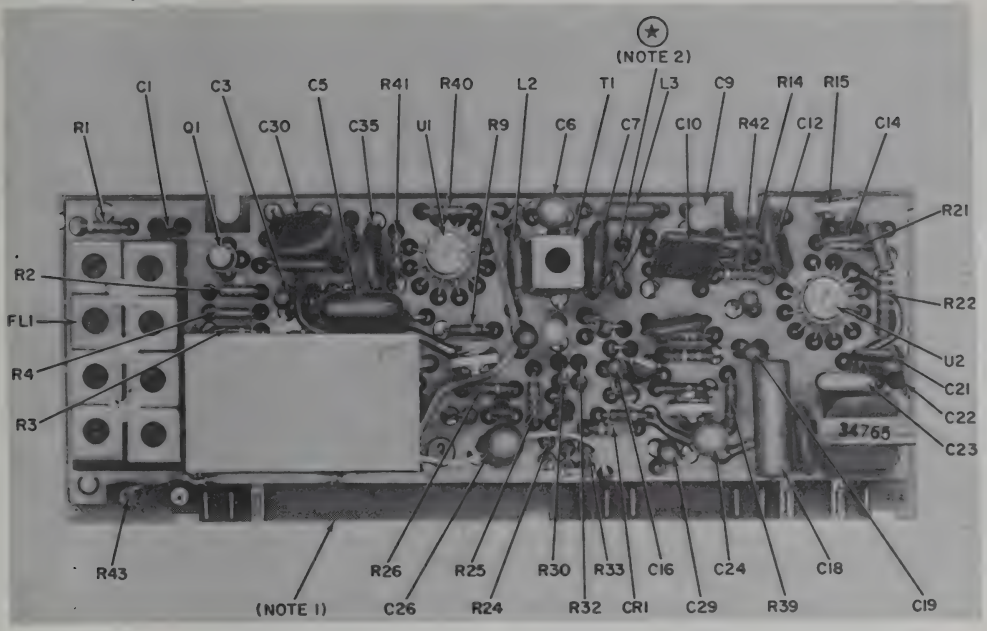
(SEE NOTES ON SHEET 1)

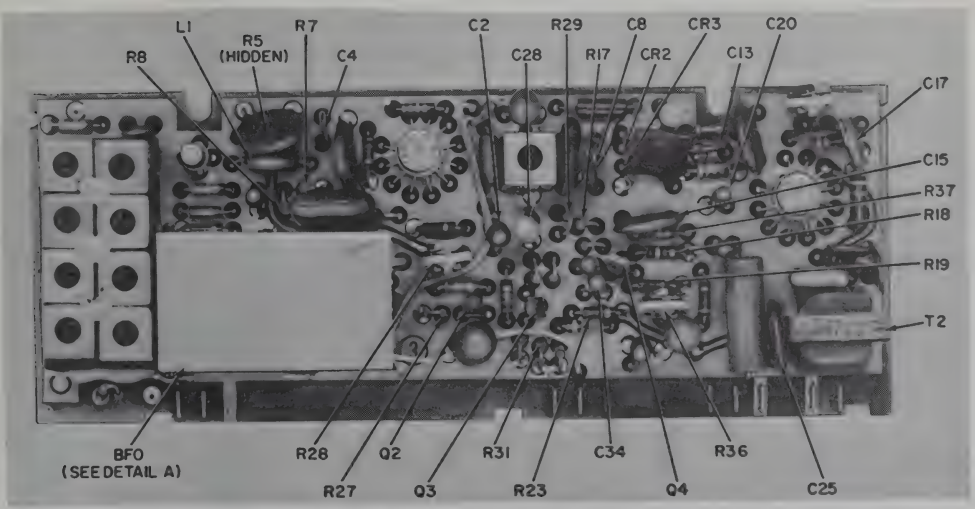
Figure 5-3. R-846A Receiver, RF Amplifier A2, Part Locations (Sheet 2)

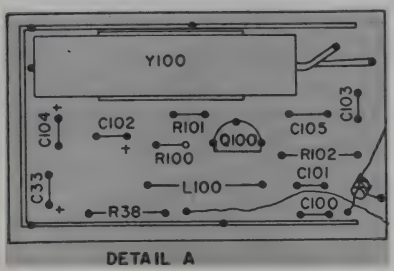


(SEE NOTES ON SHEET 1)

Figure 5-3. R-846A Receiver, RF Amplifier A2, Part Locations (Sheet 3)



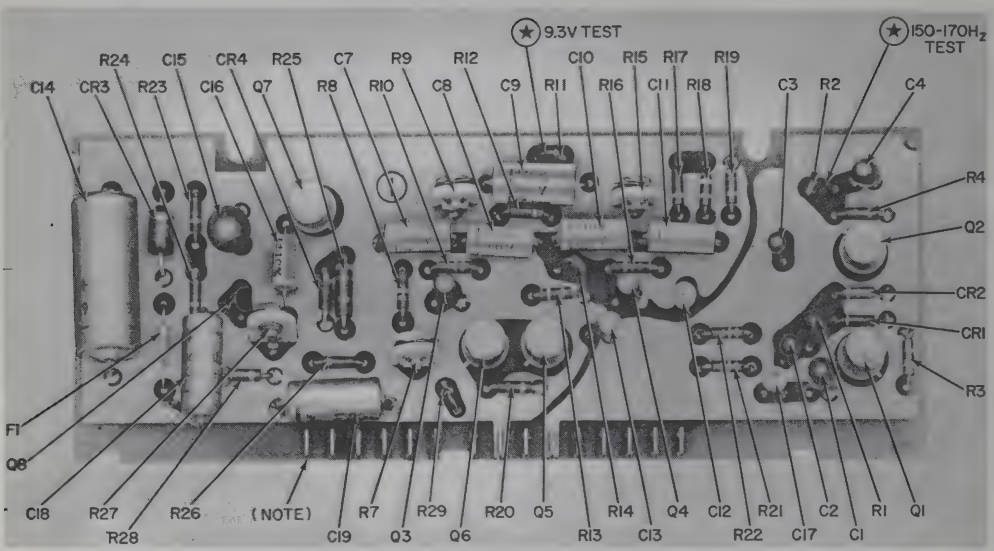




NOTES:

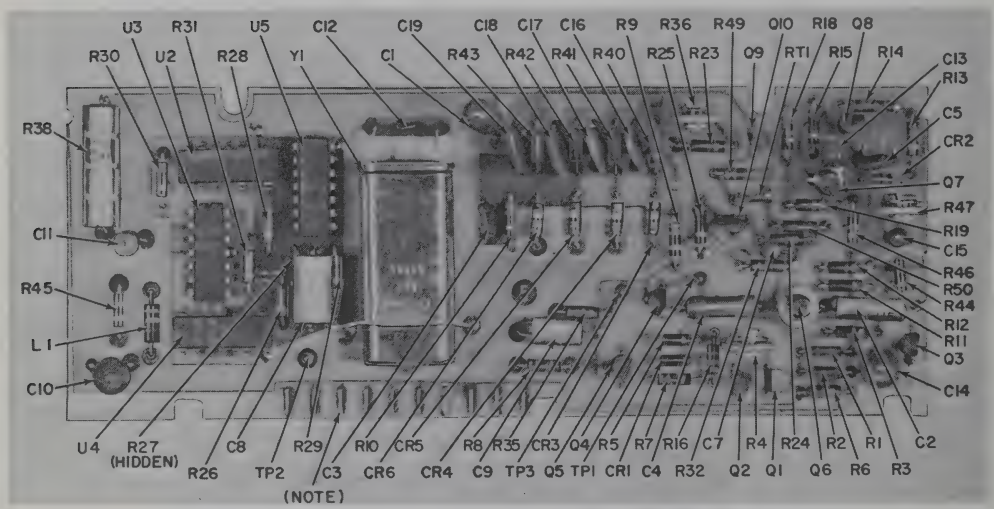
1. FROM LEFT TO RIGHT, CONTACTS ARE RELATED TO NUMBERS 26, 25, 24, 12, 11, 10, 6, 5, 4, 2, AND 1 PRINTED ON UNDERSIDE OF MOTHER BOARD A8.

Figure 5-4. R-846A Receiver, IF Amplifier A3, Part Locations



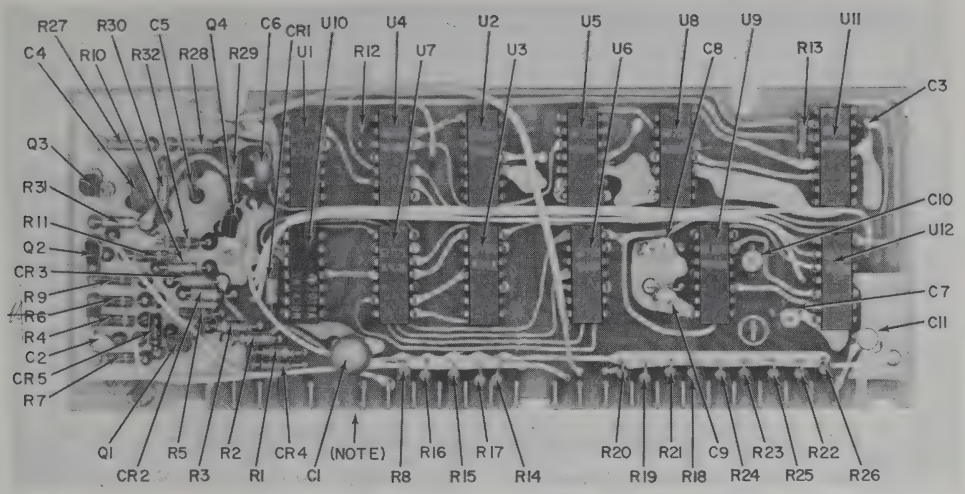
NOTE: FROM LEFT TO RIGHT, CONTACTS ARE RELATED TO NUMBERS 8 THROUGH 22 PRINTED ON UNDERSIDE OF MOTHER BOARD A8.

Figure 5-5. R-846A Receiver, Servo Amplifier A4, Part Locations



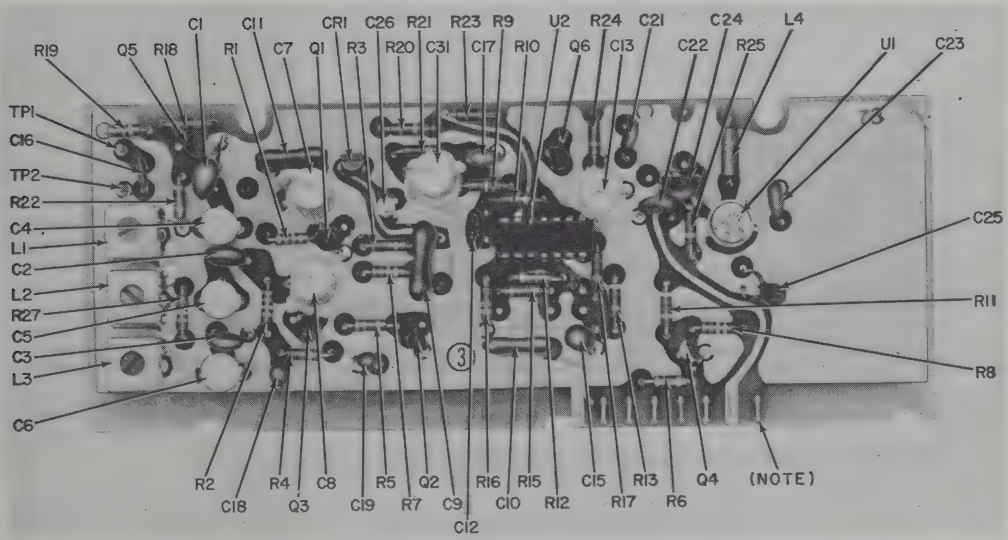
NOTE: FROM LEFT TO RIGHT, CONTACTS ARE RELATED TO NUMBERS 23 THROUGH 14 PRINTED ON UNDERSIDE OF MOTHER BOARD A8.

Figure 5-6. R-846A Receiver, Phase Detector A5, Part Locations



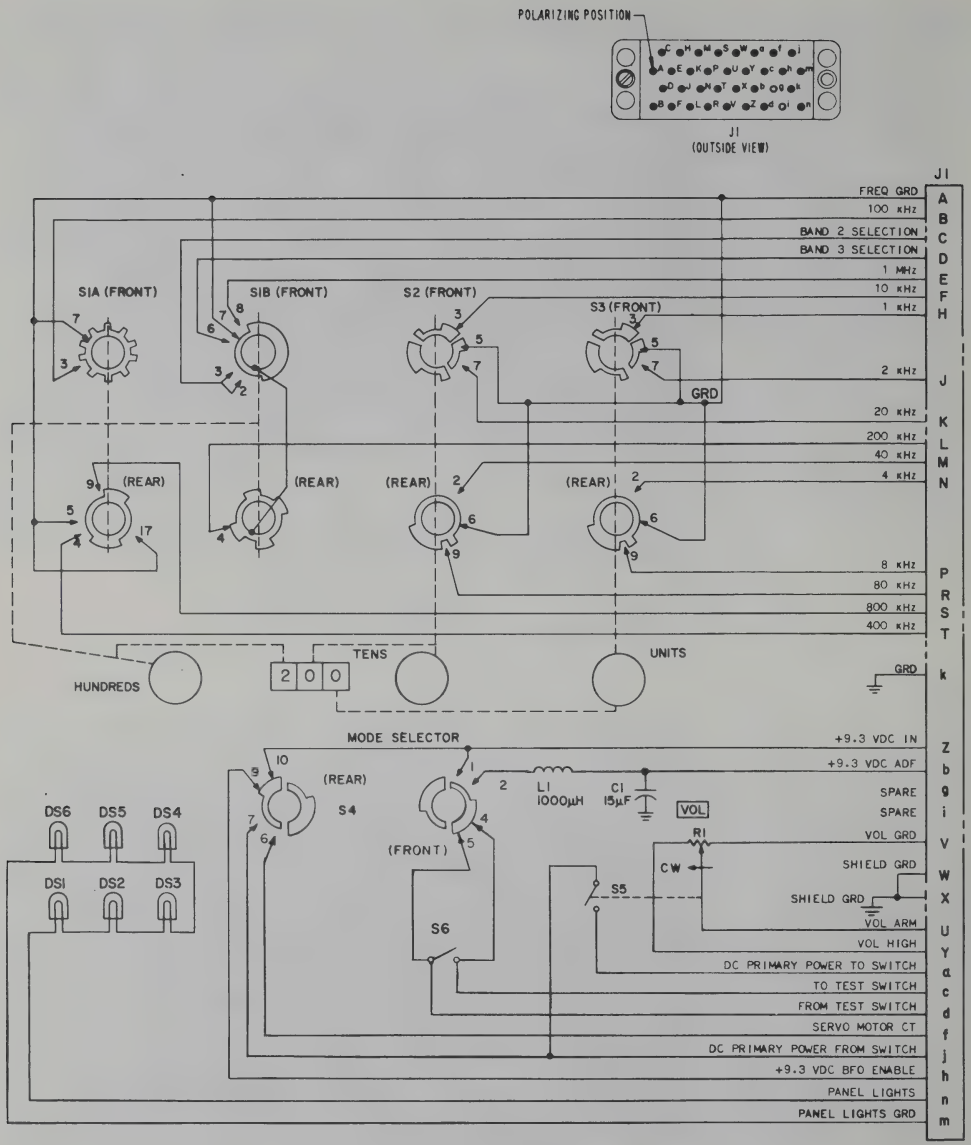
NOTE: FROM LEFT TO RIGHT, CONTACTS ARE RELATED TO NUMBERS 26 THROUGH 1 PRINTED ON UNDERSIDE OF MOTHER BOARD A8.

Figure 5-7. R-846A Receiver, N Divider A6, Part Locations



NOTE: FROM LEFT TO RIGHT, CONTACTS ARE RELATED TO NUMBERS 13 THROUGH 6 PRINTED ON UNDERSIDE OF MOTHER BOARD A8.

Figure 5-8. R-846A Receiver, VCO (Voltage Controlled Oscillator) A7, Part Locations



NOTES:

1. FOR WIRING DIAGRAM SEE FIGURE 5-10.
2. S1, S2, S3 ARE SHOWN IN 200 kHz POSITION AND ARE VIEWED FROM KNOB END.
3. S4 IS SHOWN IN EXTREME COUNTERCLOCKWISE POSITION VIEWED FROM KNOB END.

Figure 5-9. C-846A Control Unit, Schematic Diagram

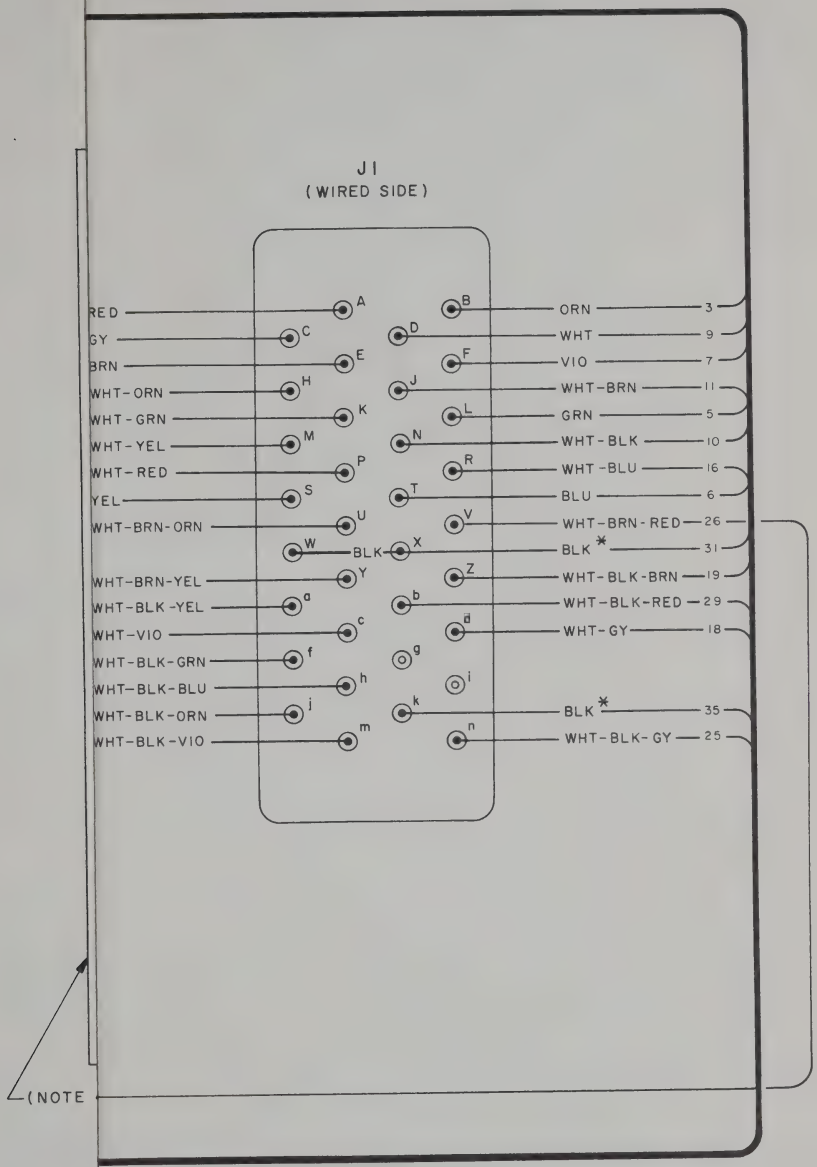
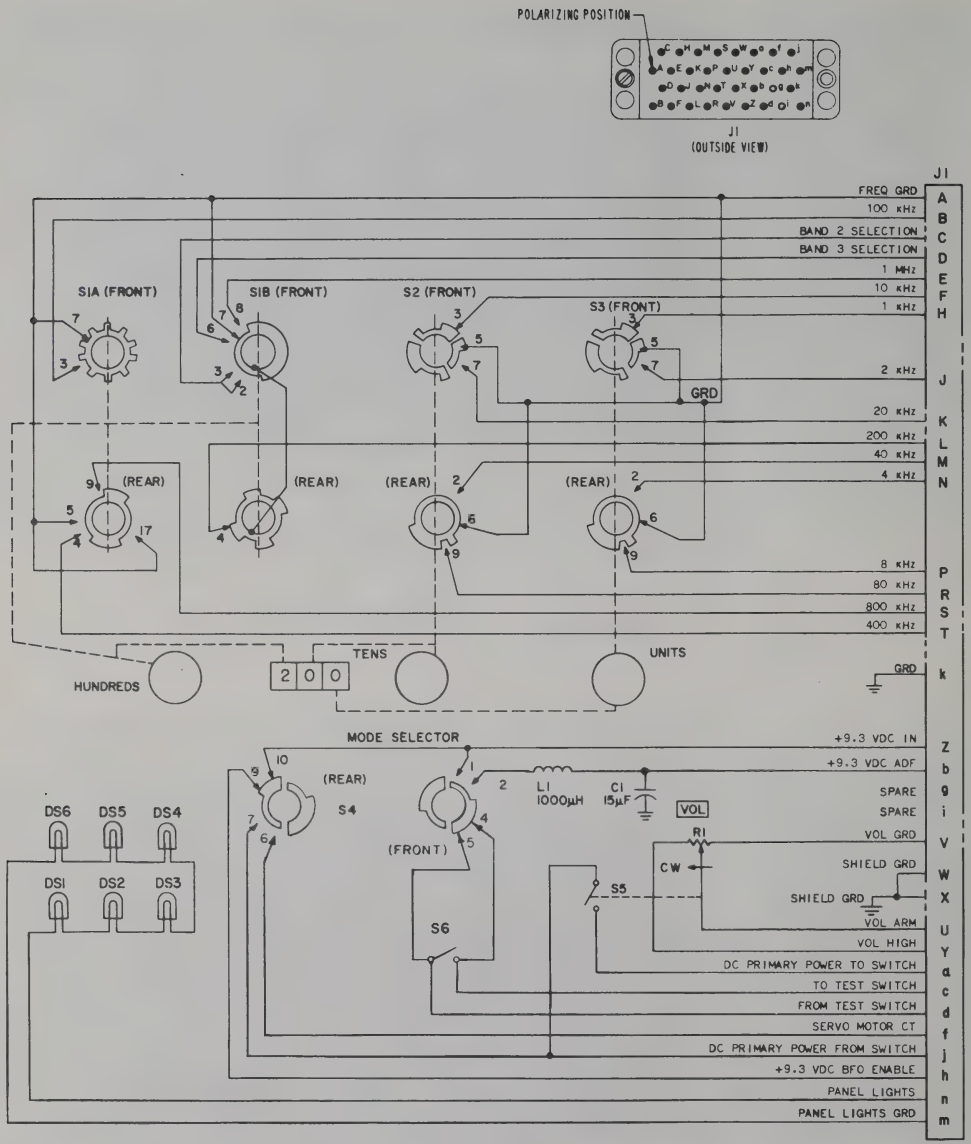


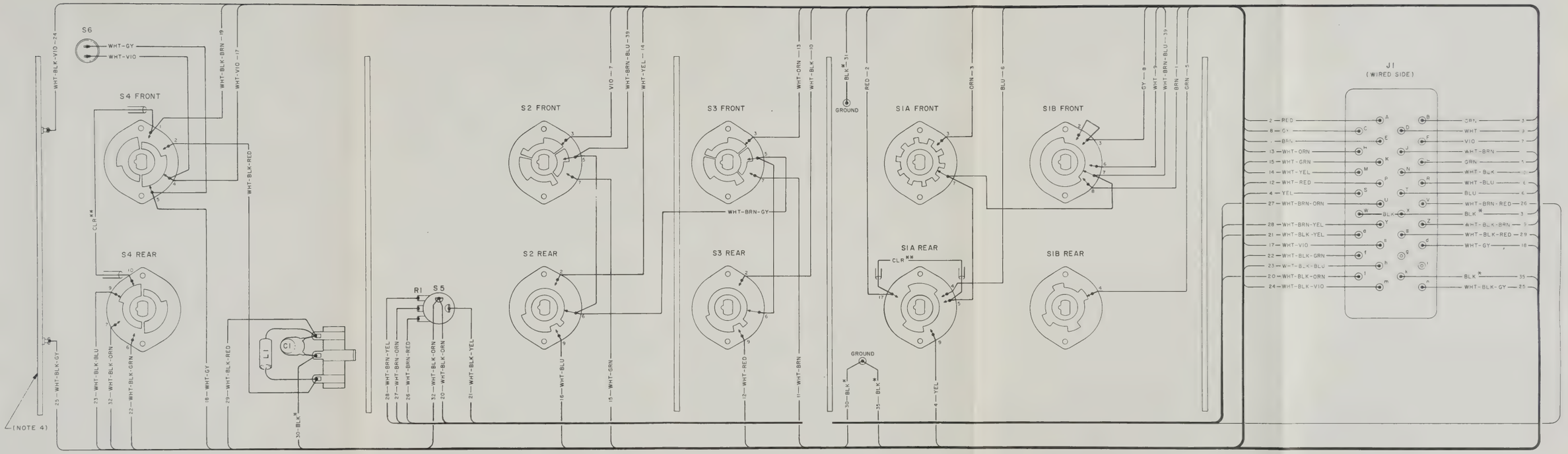
Figure 5-10. C-846A Control Unit, Wiring Diagram



NOTES:

1. FOR WIRING DIAGRAM SEE FIGURE 5-10.
2. S1, S2, S3 ARE SHOWN IN 200 kHz POSITION AND ARE VIEWED FROM KNOB END.
3. S4 IS SHOWN IN EXTREME COUNTERCLOCKWISE POSITION VIEWED FROM KNOB END.

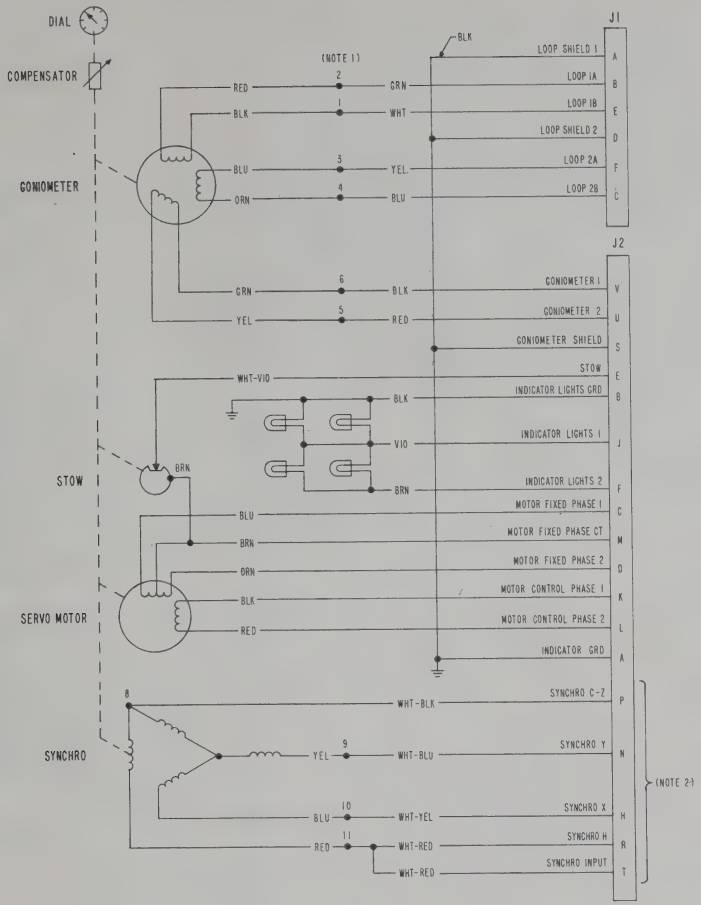
Figure 5-9. C-846A Control Unit, Schematic Diagram



NOTES:

1. FOR SCHEMATIC DIAGRAM SEE FIGURE 5-9.
2. WIRES MARKED WITH COLOR NOTE ONLY ARE NO. 24 AWG, STRANDED COPPER, TEFLON INSULATED. WIRES MARKED WITH COLOR NOTE AND ASTERISK (*) ARE NO. 22 AWG, STRANDED COPPER, TEFLON INSULATED. WIRES MARKED WITH COLOR NOTE AND DOUBLE ASTERISK (**) ARE NO. 24 AWG, SOLID COPPER, TEFLON INSULATED. UNMARKED WIRES ARE NO. 24 AWG, BARE, SOLID TINNED COPPER.
3. S1A, S1B, S2, S3, S4, S5 ARE VIEWED FROM KNOB END.
4. PRINTED CIRCUIT PANEL-LAMP BOARD WITH DS1 THROUGH DS6 (NOT SHOWN) IS MOUNTED ON FRONT OF FRONT PANEL. LAMP POWER IS SUPPLIED THROUGH WIRES 24 AND 25.

Figure 5-10. C-846A Control Unit, Wiring Diagram



NOTES:

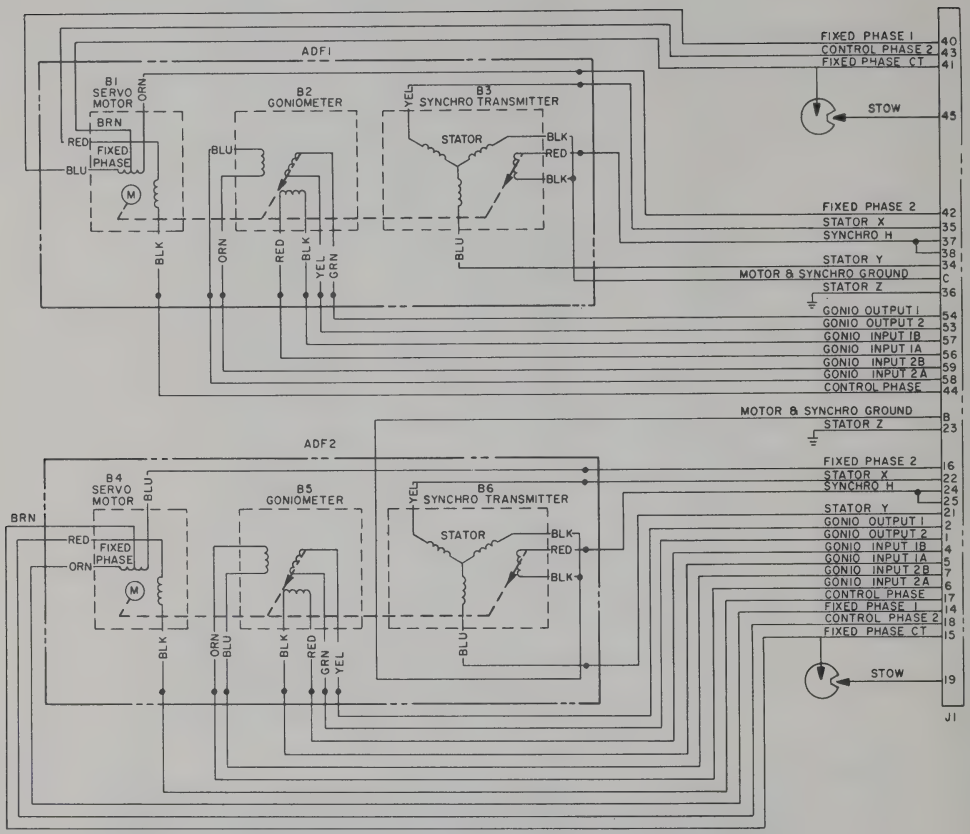
1. GONIOMETER CONNECTIONS SHOWN ARE FOR A BOTTOM-MOUNTED LOOP ANTENNA AND A TOP-MOUNTED SENSE ANTENNA. IF OTHER ANTENNA LOCATIONS ARE USED, RECONNECT GONIOMETER WIRING AS FOLLOWS:

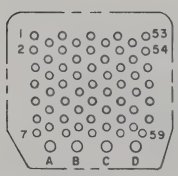
TERMINAL NUMBER

WIRE COLOR	TOP LOOP		BOTTOM LOOP	
	TOP SENSE	BOTTOM SENSE	TOP SENSE	BOTTOM SENSE
Red	6	5	5	6
Black	5	6	6	5
Green	1	1	2	2
White	2	2	1	1

2. SYNCHRO MOTOR AND ASSOCIATED WIRING ARE PART OF IN-346D ONLY.

Figure 5-11. IN-346C and IN-346D Goniometer-Indicators, Schematic Diagram

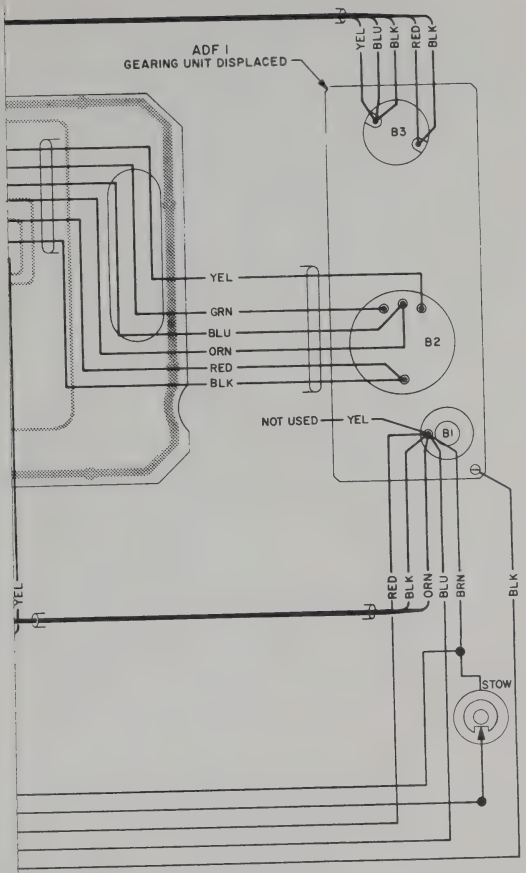




NOTES:

1. THE RA-346A AND THE RA-346B RECEIVER ACCESSORY UNITS ARE IDENTICAL EXCEPT FOR THE OMISSION OF THE ADF 2 MODULE AND ITS ASSOCIATED WIRING IN THE RA-346A.
2. J1C AND J1B ARE TIED TOGETHER AT BACK OF CONNECTOR.

Figure 5-12. RA-346A and RA-346B Receiver Accessory, Schematic Diagram



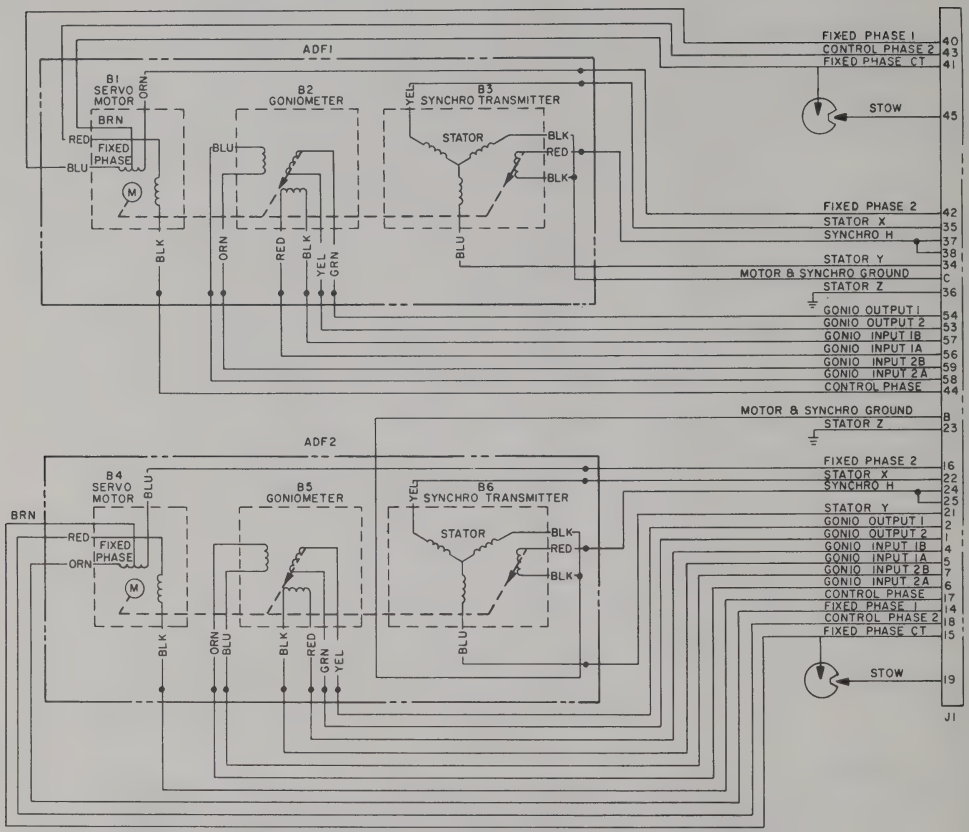
FOR ADF 1

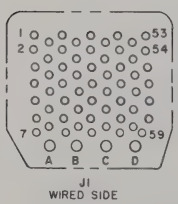
		CONNECTOR PIN NUMBERS			
R J1		TOP LOOP		BOTTOM LOOP	
T	SECOND TCR	TOP SENSE	BOTTOM SENSE	TOP SENSE	BOTTOM SENSE
K	GRAY	57	57	56	56
K	GREEN	56	56	57	57
K	RED	54	53	53	54
K	BROWN	53	54	54	53

FOR ADF 2

WIRE OLOR J1		CONNECTOR PIN NUMBERS			
		TOP LOOP		BOTTOM LOOP	
Y	TCR	TOP SENSE	BOTTOM SENSE	TOP SENSE	BOTTOM SENSE
TE	GRAY	5	5	4	4
TE	GREEN	4	4	5	5
TE	RED	2	1	1	2
TE	BROWN	1	2	2	1

A-346B Receiver Accessory, Wiring Diagram

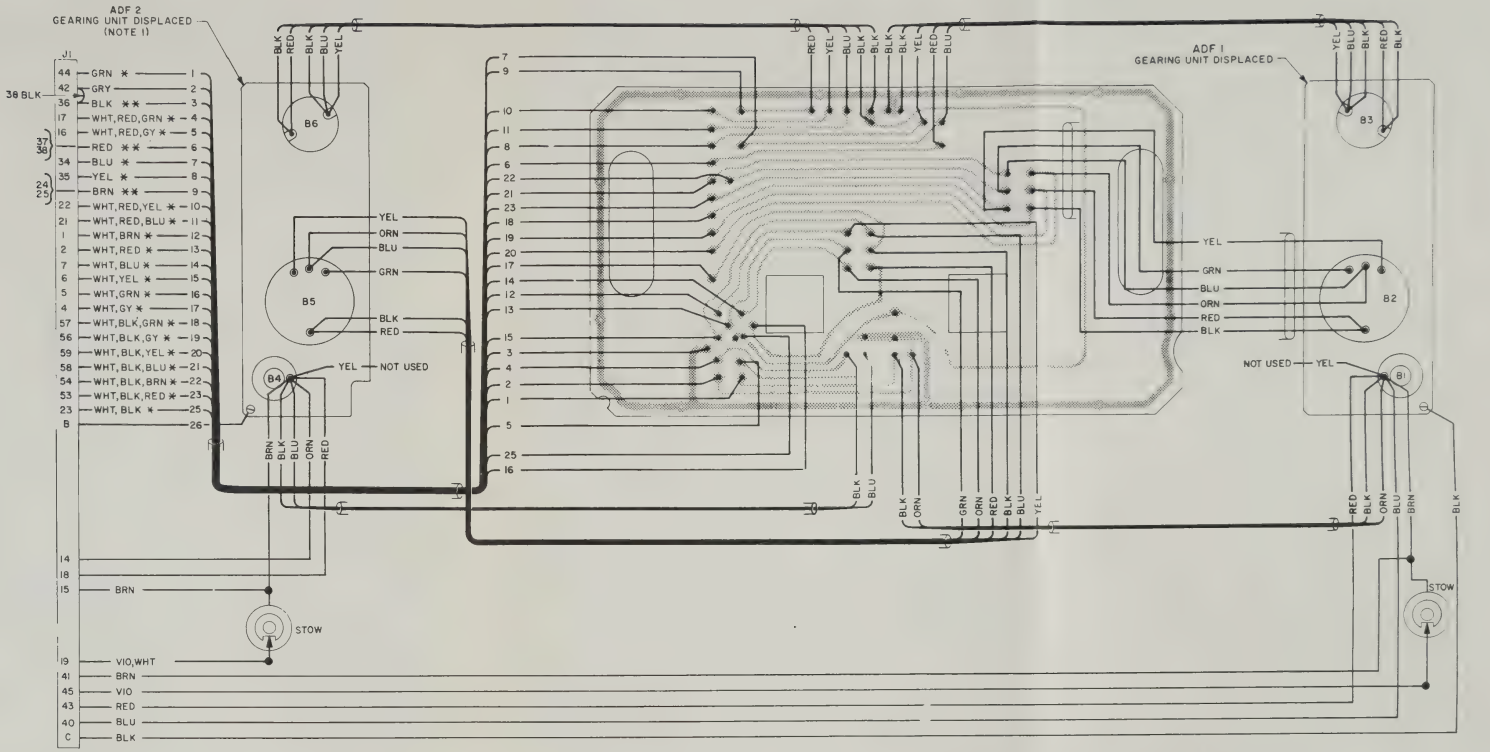




NOTES:

1. THE RA-346A AND THE RA-346B RECEIVER ACCESSORY UNITS ARE IDENTICAL EXCEPT FOR THE OMISSION OF THE ADF 2 MODULE AND ITS ASSOCIATED WIRING IN THE RA-346A.
2. J1C AND J1B ARE TIED TOGETHER AT BACK OF CONNECTOR.

Figure 5-12. RA-346A and RA-346B Receiver Accessory, Schematic Diagram



NOTES:

1. THE RA-346A AND RA-346B ACCESSORY UNITS ARE IDENTICAL EXCEPT FOR THE OMISSION OF THE ADF 2 MODULE AND ITS ASSOCIATED WIRING IN THE RA-346A.
2. FOR SCHEMATIC DIAGRAM. SEE FIGURE 5-10.
3. WIRES MARKED WITH COLOR NOTE ARE PART OF COMPONENT. WIRES MARKED WITH COLOR NOTE AND ASTERISK (*) ARE NO. 24 AWG STRANDED COPPER, TEFLON INSULATED. WIRES MARKED WITH DOUBLE ASTERISK (**) ARE NO. 20 AWG STRANDED COPPER, TEFLON INSULATED.
4. VINYLITE TUBING OF APPROPRIATE SIZE INSTALLED OVER WIRES MARKED
5. SHADED AREAS DENOTE UNETCHED COPPER.
6. THE ACCESSORY UNITS ARE WIRED FOR A BOTTOM-MOUNTED LOOP ANTENNA AND TOP-MOUNTED SENSE ANTENNA. IF OTHER ANTENNA LOCATIONS ARE USED, REWIRE J1 AS INDICATED IN THE ACCOMPANYING TABLE. THE CONTACTS OF J1 MAY BE REMOVED USING TOOL W-11, PART NO. 22001.TO REPLACE. PRESS CONTACTS INTO APPROPRIATE CONNECTOR TERMINALS.

FOR ADF 1

WIRE COLOR J1			CONNECTOR PIN NUMBERS			
			TOP LOOP		BOTTOM LOOP	
BODY	FIRST TCR	SECOND TCR	TOP SENSE	BOTTOM SENSE	TOP SENSE	BOTTOM SENSE
WHITE	BLACK	GRAY	57	57	56	56
WHITE	BLACK	GREEN	56	56	57	57
WHITE	BLACK	RED	54	53	53	54
WHITE	BLACK	BROWN	53	54	54	53

FOR ADF 2

WIRE COLOR J1		CONNECTOR PIN NUMBERS			
		TOP LOOP		BOTTOM LOOP	
BODY	TCR	TOP SENSE	BOTTOM SENSE	TOP SENSE	BOTTOM SENSE
WHITE	GRAY	5	5	4	4
WHITE	GREEN	4	4	5	5
WHITE	RED	2	1	1	2
WHITE	BROWN	1	2	2	1

Figure 5-13. RA-346A or RA-346B Receiver Accessory, Wiring Diagram

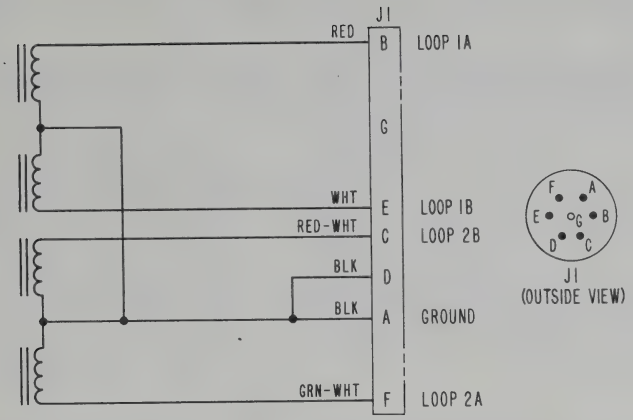
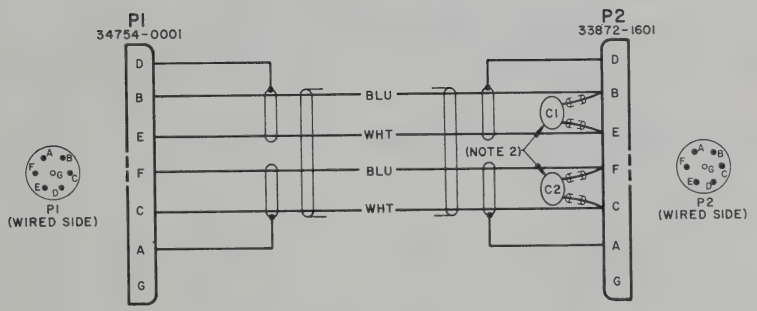


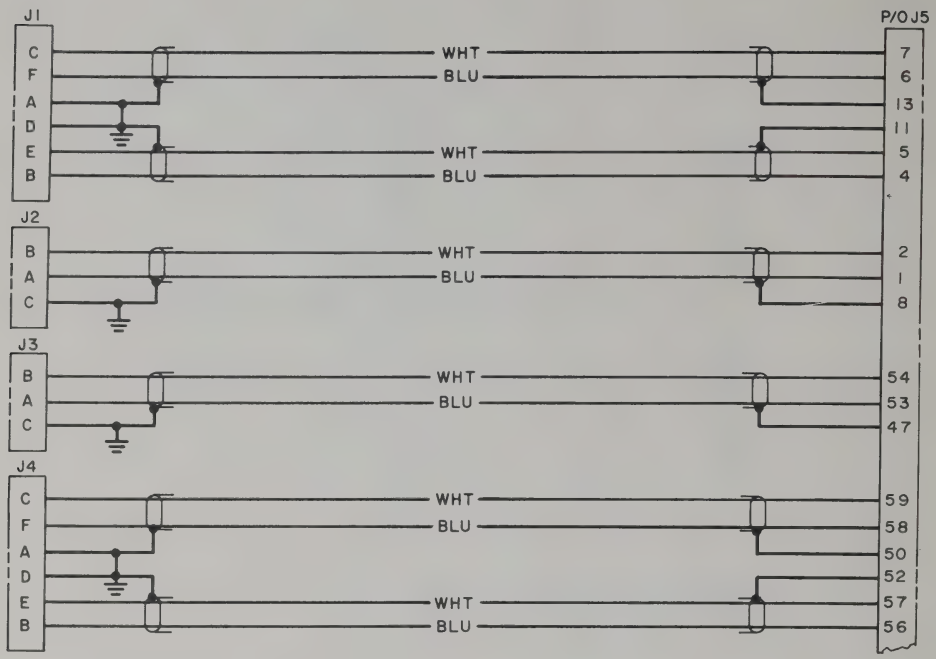
Figure 5-14. L-346A Loop Antenna, Schematic Diagram



NOTES:

1. LENGTH OF CABLE ASSEMBLY IS CRITICAL AND MUST NOT BE ALTERED. WIRES ARE NO. 30 AWG STRANDED COPPER, TEFLON INSULATED.
2. C1 AND C2 ARE PART OF 33827.

Figure 5-15. Loop Cable Assemblies, Part No. 33827 and 32803, Wiring Diagram



NOTE: BLUE AND WHITE WIRES ARE TWISTED, AND ENCLOSED IN GROUNDED SHIELDING AND TEFLON TUBING. PLACEMENT OF WIRING IS CRITICAL; DO NOT REARRANGE.

Figure 5-16. M-59B Mounting, Wiring Diagram

SECTION VI

PARTS LISTS

This section lists and describes the replaceable parts for the units of the Cessna 800 ADF System.

The parts for the R-846A Receiver are listed in an alphabetical-numerical sequence of the reference designations assigned to the parts on the schematic diagram. The reference designations, as listed, are abbreviated; for the complete designation, prefix the listed designation with the module assembly reference designation included at the beginning of each parts list. For example, the complete reference designation for C3 in Loop Module A1 would be A1C3. The location of a part by its reference designation may be determined by referring to the applicable assembly wiring diagram or parts location diagram, figures 5-2 through 5-8.

The parts for the C-846A Control Unit; IN-346C, and IN-346D Goniometer-Indicators; and for the RA-346A and RA-346B Receiver Accessory are listed in a recommended order of disassembly, except for attaching parts which are listed directly after the part attached. Index numbers are assigned in sequence to each part and are keyed to exploded view illustrations.

In all parts lists, ARC part numbers are listed in a separate column. Other manufacturers' part numbers are identified by a numerical code (as listed in the Federal Supply Code for Manufacturers, H4-2) and the manufacturer's part number. In the R-846A part list, this information is listed in a separate column. In the other parts lists, it is enclosed within parentheses at the end of the part description.

The numerical codes used in the parts lists and the related name and address of the manufacturer are as follows:

Code	Name and Address
01121	Allen-Bradley Company 1201 South 2nd Street Milwaukee, Wisconsin 53204
01295	Texas Instruments Inc. Semiconductor-Components Division 13500 North Central Expressway Dallas, Texas 75231
02660	Amphenol Corporation 2801 South 25th Avenue Broadview, Illinois 60153
03508	General Electric Company Semiconductor Products Dept. Electronics Park Syracuse, New York 13201
04713	Motorola Semiconductor Products, Inc. 5005 East McDowell Road Phoenix, Arizona 85008
08530	Reliance Mica Corporation 342 39th Street Brooklyn, New York 11201
08806	General Electric Company Miniature Lamp Dept. Cleveland, Ohio 44112
11413	Hughes Aircraft Company Industrial Systems 5261 West Imperial Highway Los Angeles, California 90009
12639	Northfield Precision Instrument Corp. 4400 Austin Boulevard Island Park, L. I., New York 11558
13327	Solitron Devices Inc. 256 Oak Tree Road Tappan, New York 10983
14433	ITT Semiconductors Div. International Telephone & Telegraph Corp. 3301 Electronics Way West Palm Beach, Florida 33401
14655	Cornell-Dubilier Corp. 50 Paris Street Newark, New Jersey 07105
14936	General Instrument Corp. Semiconductor Division 600 West John Street Hicksville, L. I., New York 11802
15450	Erie Technological Products Inc. Electronics Division 644 West 12th Street Erie, Pennsylvania 16512
22921	Master Dynamics Corporation Division of Master Specialities Company 165 San Lazaro Avenue Sunnyvale, California 95086

Code	Name and Address
27735	F-Dyne Electronics Company 1700 Post Road Fairfield, Connecticut 06430
28308	Scot Incorporated 2525 Curtiss Street Downers Grove, Illinois 60515
28965	Trush Co., U.S. Agent Stittner and Company Box 66 Cazenovia, New York 13035
44655	Ohmite Manufacturing Company 3601 Howard Street Skokie, Illinois 60076
54753	General Instrument Corp. F.W. Sickles Division 125 Front Street Chicopee, Massachusetts 01014
56289	Sprague Electric Company 367 Marshall Street North Adams, Massachusetts 01247
72136	The Electromotive Mfg. Co., Inc. South Park and John Streets Willimantic, Connecticut 06226
73445	Amperex Electronic Corporation 230 Duffy Avenue Hicksville, L.I., New York 11801
75915	Littelfuse Incorporated 800 East Northwest Highway Des Plaines, Illiniois 60016
76055	Mallory Controls Company Division of P.R. Mallory and Co., Inc. State Road 28 West Frankfort, Indiana 46041
78189	Illinois Tool Works Inc. Shakeproof Division Elgin, Illinois 60126
78488	Stackpole Carbon Company St. Marys, Pennsylvania 15857
78553	Tinnerman Products Inc. Cleveland, Ohio 44101
79136	Waldes Kohinoor Inc. Long Island City, New York 11101
80294	Bourns Incorporated 6135 Magnolia Avenue Riverside, California 92502
81312	Winchester Electronics Division of Litton Industries, Inc. Oakville, Connecticut 06779
84411	TRW Incorporated Capacitor Division 112 West First Street Ogallala, Nebraska 69153
86684	Radio Corporation of America Electronic Components and Devices Harrison, New Jersey 07029
88818	Kearfott Division Singer-General Precision Inc. 1500 McBride Avenue Little Falls, New Jersey 07424
89944	Kollsman Instrument Corporation Syossett, L.I., New York 11791
91637	Dale Electronics Inc. P. O. Box 60 Columbus, Nebraska 68601
93332	Sylvania Electric Products Inc. Semiconductor Products Division 100 Sylvan Road Woburn, Massachusetts 01801
95263	Leecraft Manufacturing Co., Inc. 21-16 44th Road Long Island City, New York 11101
96881	Thompson Industries Inc. New Hyde Park, L.I., New York 10040
97622	Gladding-Keystone Corporation Union City, New Jersey 07087
97913	Industrial Electronic Hardware Corp. 109 Prince Street New York, New York 10012

R-846A RECEIVER PARTS LIST

Reference Designation	Description	Part Number	Manufacturer & Part No.	
	LOOP MODULE A1 (Part No. 41144-0001)			
C1	CAPACITOR, Fixed, ceramic, selected value: 18-56 pF ±5%, 500 Vdc	27698-XXXX		
C2	CAPACITOR, Variable, ceramic, 4.5-20 pF ±10%, 160 Vdc	34676-0004	28965	7S-TR1K0-02
C3	CAPACITOR, Fixed, ceramic, selected value: 27-68 pF ±5%, 500 Vdc	27698-XXXX		
C4	Same as C2			
C5	CAPACITOR, Fixed, ceramic, selected value: 18-56 pF ±5%, 500 Vdc	42075-XXXX		
C6	Same as C2			
C7	CAPACITOR, Fixed, ceramic, 100,000 pF ±20%, 18 Vdc	419-15-0104		
C8	Same as C7			
C9	CAPACITOR, Fixed, tantalum, 1.0 μF ±20%, 35 Vdc	40248-2074	56289	196D105X-0035HZ1
C10	Same as C9			
C11	Same as C9			
C12	Same as C9			
C13	CAPACITOR, Fixed, cermaic, 1000 pF ±10%, 200 Vdc	30949-0102	15450	
C14	CAPACITOR, Fixed, tantalum, 10 μF ±20%, 20 Vdc	40248-2211	56289	196D106X-0020JA1
CR1	SEMICONDUCTOR DEVICE, Diode (Selected)	41075-0001 41075-0002 41075-0003 41075-0004 41075-0005		
L1	INDUCTOR, RF, 10,000 μH ±10%	34614-1103		
L2	INDUCTOR, RF, 1,000 μH ±10%	34614-1102		
Q1	TRANSISTOR	36961-4124	04713	2N4124
Q2	Same as Q1			
Q3	TRANSISTOR	39903-0001	14936	MEM571C
R1	RESISTOR, Fixed, comp, 330Ω ±10%, 1/4 w	200-0334	01121	CB3341
R2	RESISTOR, Fixed, comp, 330Ω ±10%, 1/4 w	200-0331	01121	CB3311
R3	Same as R2			
R4	Same as R1			
R5	RESISTOR, Fixed, comp, 100kΩ ±10%, 1/4 w	200-0104	01121	CB1041
R6	NOT USED			
R7	RESISTOR, Variable, 100Ω ±20%, 1/2 w	40878-1101	80294	3359W
R8	RESISTOR, Fixed, comp, 82kΩ ±10%, 1/4 w	200-0823	01121	CB8231
T1	TRANSFORMER, RF, Loop	41074-0001	54753	EX22811
T2	TRANSFORMER, RF, Loop	41074-0002	54753	EX22812
T3	TRANSFORMER, RF, Loop	41047-0003	54753	EX22593
	RF MODULE A2 (Part No. 41156-0001)			
C1	CAPACITOR, Fixed, ceramic, 2200 pF ±20%, 500 Vdc	37983-9224	56289	C023
C2	CAPACITOR, Fixed, ceramic, .01 μF ±10%, 200 Vdc	28448-0103	15450	Type X5F
C3	CAPACITOR, Fixed, tantalum, 1.0 μF ±20%, 35 Vdc	40248-2074	56289	196D105X-0035HA1

R-846A RECEIVER PARTS LIST - Continued

Reference Designation	Description	Part Number	Manufacturer & Part No.	
	RF MODULE A2 (Part No. 41156-0001) - Continued			
C4	Same as C3			
C5	CAPACITOR, Fixed, mylar, 0.01 μF ±10%, 80 Vdc	32423-9103	56289	192P
C6	Same as C5			
C7	CAPACITOR, Fixed, ceramic, 10,000 pF ±20%, 18 Vdc	41915-0103	15450	5700
C8	CAPACITOR, Fixed, mylar, .047 μF ±10%, 80 Vdc	32423-9473	56289	Type 196D
C9	CAPACITOR, Fixed, tantalum, 4.7 μF ±20%, 10 Vdc	40248-2106	56289	196D475X-0010MZ3
C10	CAPACITOR, Fixed, mica, 43 pF ±10%, 50 Vdc	37967-0430	72136	
C11	CAPACITOR, Fixed, ceramic, selected value: 18-56pF ±5%, 200 Vdc	41916-XXXX	72136	
C12	CAPACITOR, Variable, ceramic, 4.5-20 pF, ±10%, 160 Vdc	34676-0004	28965	7S-TR1K0-02
C13	Same as C3			
C14	CAPACITOR, Fixed, ceramic, 100,000 pF ±20%, 18 Vdc	41915-0104	15450	5700
C15	Same as C14			
C16	Same as C3			
C17	Same as C3			
C18	Same as C12			
C19	CAPACITOR, Fixed, ceramic, selected value: 10-39 pF ±5%, 500 Vdc	27698-XXXX		
C20	Same as C14			
C21	Same as C3			
C22	Same as C12			
C23	CAPACITOR, Fixed, ceramic, selected value: 10-33 pF ±5%, 200 Vdc	41916-XXXX		
C24	Same as C14			
C25	Same as C3			
C26	Same as C5			
C27	Same as C5			
C28	Same as C14			
C29	Same as C3			
C30	CAPACITOR, Fixed, tantalum, 68 μF ±20%, 15 Vdc	40248-2173	56289	196D686X-0015LA3
C31	CAPACITOR, Fixed, ceramic, selected value: 27-68 pF ±5%, 200 Vdc	41916-XXXX		
C32	Same as C12			
C33	CAPACITOR, Fixed, ceramic, selected value: 33-75 pF ±5%, 500 Vdc	27698-XXXX		
C34	Same as C12			
C35	CAPACITOR, Fixed, ceramic, selected value: 56-100 pF ±5%, 200 Vdc	41916-XXXX		
C36	Same as C12			
C37	Same as C14			
C38	Same as C3			
C39	Same as C14			
C40	Same as C3			
C41	Same as C3			
C42	CAPACITOR, Fixed, ceramic, 4.7 μμF ±5%, 500 Vdc	8879-9471	78488	Type GA
C43	Same as C3			
C44	Same as C5			
C45	Same as C12			
C46	CAPACITOR, Fixed, ceramic, selected value: 10-47 pF ±5%, 200 Vdc	41916-XXXX		
C47	Same as C12			

R-846A RECEIVER PARTS LIST - Continued

Reference Designation	Description	Part Number	Manufacturer & Part No.	
	RF MODULE A2 (Part No. 41156-0001) - Continued			
C48	CAPACITOR, Fixed, ceramic, selected value: 27-68 pF ±5%, 500 Vdc	27698-XXXX		
C49	Same as C12			
C50	CAPACITOR, Fixed, ceramic, selected value: 47-100 pF ±5%, 500 Vdc	27698-XXXX		
C51	Same as C9			
C52	Same as C14			
C53	Same as C3			
C54	Same as C14			
C55	Same as C3			
C56	CAPACITOR, Fixed, mylar, .022 µF ±10%, 80 Vdc	32423-9223	56289	Type 192P
C57	Same as C7			
CR1	SEMICONDUCTOR DEVICE, Diode	41416	14433	ITT 244
CR2-CR4	Same as CR1			
CR5	SEMICONDUCTOR DEVICE, Diode (Selected)	41075-0001 41075-0002 41075-0003 41075-0004 41075-0005		
CR6-CR10	Same as CR5			
L1	INDUCTOR, RF, 3300 µH ±10%	34614-1332		
L2	INDUCTOR, RF, 68,000 µH ±10%	34614-1683		
L3	INDUCTOR, RF, 1200 µH ±10%	34614-1122		
L4	INDUCTOR, RF, 220 µH ±10%	34614-1221		
L5	INDUCTOR, Variable, 500 µH nominal	41033-0001	54753	EX22630
L6	INDUCTOR, Variable, 98 µH nominal	41033-0002	54753	EX22631
L7	Same as L6			
L8	INDUCTOR, Variable, 290 µH nominal	41033-0004	54753	EX22633
L9	INDUCTOR, Variable, 1080 µH nominal	41033-0003	54753	EX22632
L10	INDUCTOR, RF 1000 µH ±10%	34614-1102		
Q1	TRANSISTOR	36961-4124	04713	2N4124
Q2	Same as Q1			
Q3	TRANSISTOR	36962-4126	04713	2N4126
Q4	Same as Q3			
Q5-Q7	Same as Q1			
Q8	TRANSISTOR	41123-0002	86684	40822
Q9-Q12	Same as Q1			
Q13	Same as Q8			
R1	RESISTOR, Fixed, comp, 330Ω ±10%, 1/4w	200-0331	01121	CB3311
R2	RESISTOR, Fixed, comp, 330kΩ ±10%, 1/4w	200-0334	01121	CB3341
R3	Same as R1			
R4	Same as R2			
R5	RESISTOR, Fixed, comp, 22kΩ ±10%, 1/4w	200-0223	01121	CB2231
R6-R10	Same as R5			
R11	RESISTOR, Fixed, comp, 2700Ω ±10%, 1/4 w	200-0272	01121	CB2721
R12	RESISTOR, Variable, 100Ω ±20%, 1/2w	40878-1101	80294	3359W
R13	RESISTOR, Fixed, comp, 3900Ω ±10%, 1/4w	200-0392	01121	CB2921
R14	RESISTOR, Fixed, comp, 1200Ω ±10%, 1/4w	200-0122	01121	CB1221
R15	RESISTOR, Fixed, comp, 200kΩ ±10%, 1/4w	200-0224	01121	CB2241
R16	Same as R1			
R17	RESISTOR, Fixed, comp, 100kΩ ±10%, 1/4w	200-0104	01121	CB1041
R18	Same as R17			

R-846A RECEIVER PARTS LIST - Continued

Reference Designation	Description	Part Number	Manufacturer & Part No.	
	RF MODULE A2 (Part No. 41156-0001) - Continued			
R19	RESISTOR, Fixed, comp, 1000Ω ±10%, 1/4w	200-0102	01121	CB1021
R20	Same as R19			
R21	Same as R2			
R22	Same as R15			
R23	Same as R2			
R24	RESISTOR, Fixed, comp, 100Ω ±10%, 1/4w	200-0101	01121	CB1011
R25	RESISTOR, Fixed, comp, 220Ω ±10%, 1/4w	200-0221	01121	CB2211
R26	Same as R1			
R27	Same as R2			
R28	Same as R2			
R29	Same as R1			
R30	RESISTOR, Fixed, comp, 120kΩ ±10%, 1/4w	200-0124	01121	CB1241
R31	Same as R30			
R32	Same as R2			
R33	RESISTOR, Fixed, comp, 2200Ω ±10%, 1/4w	200-0222	01121	CB2221
R34	RESISTOR, Fixed, comp, 1100Ω ±10%, 1/4w	200-0112	01121	CB1121
R35	Same as R1			
R36	Same as R2			
R37	Same as R2			
R38	RESISTOR, Fixed, comp, 270Ω ±10%, 1/4w	200-0271	01121	CB2711
R39	RESISTOR, Fixed, comp, 5600Ω ±10%, 1/4w	200-0562	01121	CB5621
R40	Same as R1			
R41	RESISTOR, Fixed, comp, 680Ω ±10%, 1/4w	200-0681	01121	CB6811
T1	TRANSFORMER, RF	41118	54753	EX22611
T2	TRANSFORMER, RF	41119-0001	54753	EX22902
T3	TRANSFORMER, RF	41119-0002	54753	EX22589
T4	TRANSFORMER, RF	41119-0003	54753	EX22590
	IF MODULE A3 (Part No. 41148-0002)			
C1	CAPACITOR, Fixed, ceramic, 3300 pF ±20%, 200 Vdc	30954-0032	15450	
C2	CAPACITOR, Fixed, tantalum, 10 μF ±20%, 20 Vdc	40248-2211	54289	196D106X-0020JZ1
C3	CAPACITOR, Fixed, tantalum, 1 μF ±20%, 35 Vdc	40248-2074	56289	196D105X-0035HA1
C4	Same as C1			
C5	CAPACITOR, Fixed, mylar, 0.22 μF ±20%, 50 Vdc	39989-9222	84411	Type 601PE
C6	CAPACITOR, Fixed, tantalum, 33 μF ±20%, 25 Vdc	40248-2518	56289	196D336X-0025LA3
C7	CAPACITOR, Fixed, mica, 470 pF ±5%, 500 Vdc	27513-0471		
C8	CAPACITOR, Fixed, ceramic 150 pF ±10%, 200 Vdc	28448-0151	15450	Type GP4
C9	CAPACITOR, Fixed, tantalum, 4.7 μF ±20%, 35 Vdc	40248-2366	56289	196D475X-0035JA1
C10	CAPACITOR, Fixed, ceramic, 4700 pF ±10%, 200 Vdc	30949-0472	15450	
C11	NOT USED			
C12	CAPACITOR, Fixed, ceramic, 0.1 μF +80, -20%, 25 Vdc	31456-9102	15450	
C13	CAPACITOR, Fixed, ceramic, 3300 pF ±10%, 200 Vdc	30954-0332	15450	
C14	CAPACITOR, Fixed, ceramic, 2200 pF ±10%, 200 Vdc	30949-0222	15450	
C15	Same as C12			

R-846A RECEIVER PARTS LIST - Continued

Reference Designation	Description	Part Number	Manufacturer & Part No.	
	IF MODULE A3 (Part No. 41148-0002)			
C16	CAPACITOR, Fixed, tantalum, 2.2 μF ±20%, 20 Vdc	40248-2203	56289	196D225X-0020HA1
C17	Same as C14			
C18	CAPACITOR, Fixed, mylar, 0.33 μF ±20%, 50 Vdc	39989-9332	84411	Type 601PE
C19	Same as C3			
C20	Same as C16			
C21	Same as C14			
C22	Same as C14			
C23	CAPACITOR, Fixed, plastic, 0.047 μF ±10%, 250 Vdc	36054-1473	73445	C280AE
C24	CAPACITOR, Fixed, tantalum, 68 μF ±20%, 15 Vdc	40248-2173	56289	196D686X-0015LA3
C25	Same as C12			
C26	CAPACITOR, Fixed, tantalum, 150 μF ±20%, 15 Vdc	40248-2177	56289	196D157X-0015MA3
C27	NOT USED			
C28	CAPACITOR, Fixed, tantalum, 22 μF ±20%, 15 Vdc	40248-2166	56289	196D226X-0015KA1
C29	Same as C2			
C30	Same as C12			
C31	NOTE USED			
C32	NOT USED			
C33	Same as C2			
C34	Same as C16			
C35	Same as C12			
C100	CAPACITOR, Fixed, mica, 100 pF ±10%, 50 Vdc	37967-0101	72136	
C101	CAPACITOR, Fixed, ceramic, 470 pF ±10%, 200 Vdc	30949-0471	15450	
C102	Same as C3			
C103	Same as C1			
C104	Same as C3			
C105	CAPACITOR, Fixed, ceramic, 1500 pF ±10%, 200 Vdc	30949-0152	15450	
CR1	SEMICONDUCTOR DEVICE, Diode	19663-0000	11413	1N90
CR2	Same as CR1			
CR3	Same as CR1			
FL1	FILTER, Bandpass, 141.0 kHz	41808	54753	EX23750
L1	INDUCTOR, RF, 4700 μH ±5%	34614-0472		
L2	INDUCTOR, RF, 1000 μH ±5%	34614-0102		
L3	Same as L2			
L100	INDUCTOR, RF, 3900 μH ±5%	34614-0392		
Q1	TRANSISTOR	39409-0000	86684	40673
Q2	TRANSISTOR	36961-4124	04713	2N4124
Q3	Same as Q2			
Q4	Same as Q2			
Q100	TRANSISTOR	36962-4126	04713	2N4126
R1	RESISTOR, Fixed, comp, 47 kΩ ±10%, 1/4w	200-0473	01121	CB4731
R2	RESISTOR, Fixed, comp, 330 kΩ ±10%, 1/4w	200-0334	01121	CB3341
R3	RESISTOR, Fixed, comp, 270Ω ±5%, 1/4w	341-0271	01121	CB2715
R4	RESISTOR, Fixed, comp, 100Ω ±10%, 1/4w	200-0101	01121	CB1011
R5	RESISTOR, Fixed, comp, 22kΩ ±10%, 1/4w	200-0223	01121	CB2231
R6	NOT USED			

R-846A RECEIVER PARTS LIST - Continued

Reference Designation	Description	Part Number	Manufacturer & Part No.	
	IF MODULE A3 (Part No. 41148-0002) - Continued			
R7	RESISTOR, Fixed, comp, 4700Ω ±10%, 1/4w	200-0472	01121	CB4721
R8	RESISTOR, Fixed, comp, 680Ω ±10%, 1/4w	200-0681	01121	CB6811
R9	RESISTOR, Fixed, comp, 22Ω ±10%, 1/4w	200-0220	01121	CB2201
R10-R13	NOT USED			
R14	RESISTOR, Fixed, comp, 47kΩ ±10%, 1/4w	200-0473	01121	CB4731
R15	RESISTOR, Variable, 47kΩ ±20%, 1/2w	40878-1473	80294	3359W
R16	NOT USED			
R17	RESISTOR, Fixed, comp, 100kΩ ±10%, 1/4w	200-0104	01121	CB1041
R18	RESISTOR, Fixed, comp, 39kΩ ±10%, 1/4w	200-0393	01121	CB3931
R19	RESISTOR, Fixed, comp, 1000Ω ±10%, 1/4w	200-0102	01121	CB1021
R20	RESISTOR, Fixed, comp, 2200Ω ±10%, 1/4w	200-0222	01121	CB2221
R21	RESISTOR, Fixed, comp, 470kΩ ±10%, 1/4w	200-0474	01121	CB4741
R22	RESISTOR, Fixed, comp, 3.3Ω ±5%, 1/2w	201-9331	01121	EB9331
R23	RESISTOR, Fixed, comp, 10Ω ±10%, 1/4w	200-0100	01121	CB1001
R24	RESISTOR, Fixed, comp, 56kΩ ±10%, 1/4w	200-0563	01121	CB5631
R25	RESISTOR, Fixed, comp, 33kΩ ±10%, 1/4w	200-0333	01121	CB3331
R26	RESISTOR, Fixed, comp 3300Ω ±10%, 1/4w	200-0332	01121	CB3321
R27	RESISTOR, Fixed, comp, 270Ω ±10%, 1/4w	200-0271	01121	CB2711
R28	Same as R15			
R29	RESISTOR, Fixed, comp, 15Ω ±10%, 1/4w	200-0150	01121	CB1501
R30	Same as R7			
R31	NOT USED			
R32	Same as R2			
R33	Same as R25			
R34	NOT USED			
R35	NOT USED			
R36	Same as R15			
R37	Same as R17			
R38	Same as R4			
R39	Same as R7			
R40	Same as R2			
R41	RESISTOR, Fixed, comp, 33Ω ±10%, 1/4w	200-0330	01121	CB3301
R42	RESISTOR, Fixed comp, 43kΩ ±5%, 1/4w	341-0433	01121	CB4335
R43	Same as R5			
R44	RESISTOR, Fixed, comp, 390Ω ±10%, 1/4w	200-0391	01121	CB3911
R45	RESISTOR, Fixed, comp, 240Ω ±5%, 1/4w	341-0241	01121	CB2415
R100	RESISTOR, Fixed, comp, 8200Ω ±10%, 1/4w	200-0822	01121	CB8221
R101	RESISTOR, Fixed, comp, 2200Ω ±10%, 1/4w	200-0222	01121	CB2221
R102	RESISTOR, Fixed, comp, 1800Ω ±10%, 1/4w	200-0182	01121	CB1821
RT1	THERMISTOR	40651		
T1	TRANSFORMER, IF	41088-0000	54753	EX22906
T2	TRANSFORMER, AUDIO	34765-0000	97622	GK3379
U1	INTEGRATED CIRCUIT, Audio amplifier	38265-0000	86684	CA3020
U2	Same as U1			
W100	CABLE, RF	18327		
Y100	CRYSTAL, Quartz, 142.000 kHz	41809		

R-846A RECEIVER PARTS LIST - Continued

Reference Designation	Description	Part Number	Manufacturer & Part No.	
	SERVO MODULE A4 (Part No. 41146-0001)			
C1	CAPACITOR, Fixed, tantalum, 15 μF ±10%, 20 Vdc	40248-1213	56289	196D156X-9020KA1
C2	CAPACITOR, Fixed, tantalum, 1.0 μF ±20%, 35 Vdc	40248-2074	56289	196D105X-0035HA1
C3	Same as C2			
C4	Same as C1			
C5	NOT USED			
C6	NOT USED			
C7	CAPACITOR, Fixed, mylar, .033 μF ±10%, 80 Vdc	32423-9333	56289	Type 192P
C8	Same as C7			
C9	CAPACITOR, Fixed, mylar, 0.15 μF ±10%, 80 Vdc	32423-9152	56289	Type 192P
C10	Same as C7			
C11	Same as C7			
C12	CAPACITOR, Fixed, tantalum, 4.7 μF ±20%, 35 Vdc	40248-2366	56289	196D475X-0035JA1
C13	Same as C12			
C14	CAPACITOR, Fixed, tantalum, 140 μF ±20%, 60 Vdc	41914	56289	Type 109D
C15	CAPACITOR, Fixed, tantalum, 47 μF ±20%, 25 Vdc	40248-2520	56289	196D476X-0025MA3
C16	CAPACITOR, Fixed, mylar, .01 μF ±10%, 80 Vdc	32423-9103	56289	Type 192P
C17	Same as C12			
C18	CAPACITOR, Fixed, tantalum, 100 μF ±20%, 20 Vdc	40248-2224	56289	Type 196D
C19	Same as C18			
CR1	SEMICONDUCTOR DEVICE, Diode	36289-0005	01295	1N458
CR2	Same as CR1			
CR3	SEMICONDUCTOR DEVICE, Rectifier, silicon	33831-0201	13327	FSCER69-5
CR4	SEMICONDUCTOR DEVICE, Diode, zener	35954-9561	04713	1N4734A
F1	FUSE, Instrument, 3 amperes	36968-3000	75915	275002
Q1	TRANSISTOR	34619	86684	2N3053
Q2	Same as Q1			
Q3	TRANSISTOR	39269-5305	03508	2N5305
Q4	Same as Q3			
Q5	Same as Q1			
Q6	Same as Q1			
Q7	Same as Q1			
Q8	TRANSISTOR	36961-4124	04713	2N4124
R1	RESISTOR, Fixed, comp, 27kΩ ±10%, 1/4w	200-0273	01121	CB2731
R2	Same as R1			
R3	RESISTOR, Fixed, comp, 27Ω ±10%, 1/4w	200-0270	01121	CB2701
R4	Same as R3			
R5	NOT USED			
R6	NOT USED			
R7	RESISTOR, Variable, 2000Ω ±20&, 1/2w	40878-1222	80294	3359W
R8	RESISTOR, Fixed, comp, 120kΩ ±10%, 1/4w	200-0124	01121	CB1241
R9	RESISTOR, Variable, 5kΩ ±20%, 1/2w	40878-1472	80294	3359W
R10	RESISTOR, Fixed, comp, 270kΩ ±10%, 1/4w	200-0274	01121	CB2741
R11	RESISTOR, Fixed, comp, 2200Ω ±10%, 1/4w	200-0222	01121	CB2221
R12	RESISTOR, Fixed, comp, 1200Ω ±10%, 1/4w	200-0122	01121	CB1221
R13	RESISTOR, Fixed, comp, 3900Ω ±10%, 1/4w	200-0392	01121	CB3921

R-846A RECEIVER PARTS LIST - Continued

Reference Designation	Description	Part Number	Manufacturer & Part No.	
	SERVO MODULE A4 (Part No. 41146-0001) - Continued			
R14	Same as R8			
R15	Same as R9			
R16	Same as R10			
R17	RESISTOR, Fixed, comp, 1kΩ ±10%, 1/4w	200-0102	01121	CB1021
R18	Same as R13			
R19	RESISTOR, Fixed, comp, 470Ω ±10%, 1/4w	200-0471	01121	CB4711
R20	RESISTOR, Fixed, comp, 22Ω ±10%, 1/4w	200-0220	01121	CB2201
R21	RESISTOR, Fixed, comp, 560kΩ ±10%, 1/4w	200-0564	01121	CB5641
R22	Same as R21			
R23	RESISTOR, Fixed, comp, 150Ω ±10%, 1/4w	200-0151	01121	CB1511
R24	Same as R23			
R25	RESISTOR, Fixed, comp, 68Ω ±5%, 1/2w	201-0680	01121	EB6801
R26	Same as R12			
R27	Same as R7			
R28	Same as R11			
R29	RESISTOR, Fixed, comp, 680Ω ±10%, 1/4w	200-0681	01121	CB6811
	PHASE DETECTOR MODULE A5 (Part No. 41152-0001)			
C1	CAPACITOR, Fixed, tantalum, 68 μF ±20%, 15 Vdc	40248-2173	56289	196D686X-0015LA3
C2	CAPACITOR, Fixed, mylar, .022 μF ±10%, 100 Vdc	32423-9223	56289	192P
C3	CAPACITOR, Fixed, ceramic, 4700 pF ±20%, 200 Vdc	30954-0472	15450	
C4	Same as C2			
C5	CAPACITOR, Fixed, ceramic, .01 μF ±10%, 100 Vdc	32423-9103	56289	192P
C6	NOT USED			
C7	CAPACITOR, Fixed, tantalum, 4.7 μF ±20%, 10 Vdc	40248-2106	56289	196D475X-0010MA3
C8	CAPACITOR, Fixed, mylar, 0.1 μF ±10%, 100 Vdc	32423-9102	56289	192P
C9	Same as C5			
C10	CAPACITOR, Fixed, tantalum, 10 μF ±20%, 35 Vdc	40248-2371	56289	196D106X-0035LA3
C11	CAPACITOR, Fixed, tantalum 33 μF ±20%, 10 Vdc	40248-2116	56289	196D336X-0010KA1
C12	CAPACITOR, Fixed, ceramic, 220 μF ±10%, 200Vdc	30949-0221	15450	
C13	CAPACITOR, Fixed, tantalum 6.8 μF ±20%, 35 Vdc	40248-2368	56289	196D685X-0035KA1
C14	CAPACITOR, Fixed, tantalum, 100 μF ±20%, 20 Vdc	40248-2224	56289	196D107X-0020MA3
C15	CAPACITOR, Fixed, tantalum, 1 μF ±20%, 35 Vdc	40248-2074	56289	196D105X-0035HA1
C16	CAPACITOR, Fixed, ceramic, 0.1 μF ±20%, 18 Vdc	41915-0104	15450	5700
C17	Same as C16			
C18	Same as C16			
C19	Same as C16			
CR1	SEMICONDUCTOR DEVICE, Diode	32689-0005	01295	1N458
CR2	SEMICONDUCTOR DEVICE, Diode	34410	93332	1N270
CR3-CR6	Same as CR1			
L1	INDUCTOR, RF, 22 μH ±20%	34894-0220		

R-846A RECEIVER PARTS LIST - Continued

Reference Designation	Description	Part Number	Manufacturer & Part No.	
PHASE DETECTOR MODULE A5 (Part No. 41152-0001) - Continued				
Q1	TRANSISTOR	36962-4126	04713	2N4126
Q2	Same as Q1			
Q3	TRANSISTOR	36961-4124	04713	2N4124
Q4	Same as Q3			
Q5	Same as Q3			
Q6	TRANSISTOR	38779	04713	2N4352
Q7	TRANSISTOR	41123-0001	01295	2N3821
Q8	Same as Q1			
Q9	Same as Q3			
Q10	Same as Q1			
R1	RESISTOR, Fixed, comp, 3300Ω±10%, 1/4w	200-0332	01121	CB3321
R2	RESISTOR, Fixed, comp, 15kΩ±10%, 1/4w	200-0153	01121	CB1531
R3	RESISTOR, Fixed, comp, 10kΩ±10%, 1/4w	200-0103	01121	CB1031
R4	RESISTOR, Variable, 10kΩ±20%, 1/2w	40878-1103	80294	3359W
R5	RESISTOR, Fixed, comp, 1kΩ±10%, 1/4w	200-0102	01121	CB1021
R6	Same as R2			
R7-R10	Same as R1			
R11	Same as R5			
R12	Same as R3			
R13	RESISTOR, Fixed, comp, 560Ω±10%, 1/4w	200-0561	01121	CB5611
R14	RESISTOR, Fixed, comp, 27Ω±10%, 1/4w	200-0270	01121	CB2701
R15	Same as R5			
R16	RESISTOR, Fixed, comp, 4700Ω±10%, 1/4w	200-0472	01121	CB4721
R17	NOT USED			
R18	RESISTOR, Fixed, comp, 2700Ω±10%, 1/4w	200-0272	01121	CB2721
R19	RESISTOR, Fixed, comp, 22kΩ±10%, 1/4w	200-0223	01121	CB2231
R20	NOT USED			
R21	NOT USED			
R22	NOT USED			
R23	RESISTOR, Fixed, comp, 1800Ω±10%, 1/4w	200-0182	01121	CB1821
R24	RESISTOR, Fixed, comp, 120Ω±10%, 1/4w	200-0121	01121	CB1211
R25	RESISTOR, Fixed, comp, 1200Ω±10%, 1/4w	200-0122	01121	CB1221
R26	Same as R5			
R27	Same as R5			
R28	Same as R1			
R29-R31	Same as R5			
R32	RESISTOR, Fixed, comp, 12kΩ±10%, 1/4w	200-0123	01121	CB1231
R33	NOT USED			
R34	NOT USED			
R35	RESISTOR, Fixed, comp, 68kΩ±10%, 1/4w	200-0683	01121	CB6831
R36	RESISTOR, Variable, 2200Ω±20%, 1/2w	40878-1222	80294	3359W
R37	NOT USED			
R38	RESISTOR, Fixed, ww, 15Ω±5%, 5w	36604-0150	44655	995-5B
R39	NOT USED			
R40	RESISTOR, Fixed, comp, 8200Ω±10%, 1/4w	200-0822	01121	CB8221
R41-R43	Same as R40			
R44	RESISTOR, Fixed, comp, 51Ω±5%, 1/4w	341-0510	01121	CB5105
R45	RESISTOR, Fixed, comp, 27Ω±10%, 1/4w	200-0270	01121	CB2701
R46	RESISTOR, Fixed, comp, 120kΩ±10%, 1/4w	200-0124	01121	CB1241
R47	RESISTOR, Variable, 47kΩ±20%, 1/2w	40878-1473	80294	3359W
R48	NOT USED			
R49	RESISTOR, Fixed, comp, 330Ω±5%, 1/4w	341-0331	01121	CB3315
R50	RESISTOR, Fixed, comp, 270Ω±5%, 1/4w	341-0271	01121	CB2715
RT1	RESISTOR, Thermal, 500Ω±10%	40651		

R-846A RECEIVER PARTS LIST - Continued

Reference Designation	Description	Part Number	Manufacturer & Part No.	
	PHASE DETECTOR MODULE A5 (Part No. 41152-0001) - Continued			
U1	NOT USED			
U2	INTEGRATED CIRCUIT, 4-bit, binary counter	41842	01295	5493
U3	INTEGRATED CIRCUIT, Flip-flop	41846	01295	5473
U4	INTEGRATED CIRCUIT, Master-slave, flip-flop	41837	01295	5472
U5	INTEGRATED CIRCUIT, NAND gate	41844	01295	5440
Y1	CRYSTAL, Quartz, 128.000 kHz	41834		
	N DIVIDER MODULE A6 (Part No. 41154-0001)			
C1	CAPACITOR, Fixed, tantalum, 220 µF ±20%, 10 Vdc	40248-2126	56289	196D227X-0010MA3
C2	CAPACITOR, Fixed, tantalum, 4.7 µF ±20%, 10 Vdc	40248-2106	56289	196D475X-0010HA1
C3	CAPACITOR, Fixed, ceramic, 220 pF ±10%, 200 Vdc	30949-0221	15450	
C4	CAPACITOR, Fixed, ceramic, 47 pF ±5%, 200 Vdc	29597-0470		
C5	CAPACITOR, Fixed, ceramic, 1000 pF ±10%, 200 Vdc	30949-0102	15450	
C6	CAPACITOR, Fixed, ceramic, 100 pF ±10%, 200 Vdc	28448-0101	15450	
C7-C11	Same as C2			
CR1	SEMICONDUCTOR DEVICE, Diode	34410	93332	1N270
CR2	Same as CR1			
CR3	Same as CR1			
CR4	SEMICONDUCTOR DEVICE, Diode	32689-0005	01295	1N458
CR5	Same as CR4			
Q1	TRANSISTOR	36961-4124	04713	2N4124
Q2-Q4	Same as Q1			
R1	RESISTOR, Fixed, comp, 560Ω ±10%, 1/4w	200-0561	01121	CB5611
R2	RESISTOR, Fixed, comp, 330Ω ±10%, 1/4w	200-0331	01121	CB3311
R3	RESISTOR, Fixed, comp, 1kΩ ±10%, 1/4w	200-0102	01121	CB1021
R4	RESISTOR, Fixed, comp, 100Ω ±10%, 1/4w	200-0101	01121	CB1011
R5	Same as R3			
R6	Same as R3			
R7	Same as R2			
R8	Same as R1			
R9	Same as R4			
R10-R27	Same as R3			
R28	RESISTOR, Fixed, comp, 27kΩ ±10%, 1/4w	200-0273	01121	CB2731
R29	Same as R3			
R30	RESISTOR, Fixed, comp, 10kΩ ±105, 1/4w	200-0103	01121	CB1031
R31	Same as R3			
R32	RESISTOR, Fixed, comp, 4700Ω ±10%, 1/4w	200-0472	01121	CB4721
U1	INTEGRATED CIRCUIT, Hex inverter	41838	01295	5404
U2	INTEGRATED CIRCUIT, Decade counter	41836	01295	5490
U3	INTEGRATED CIRCUIT, Quad 2, input positive, NOR gate	41839	01295	5402
U4	INTEGRATED CIRCUIT, NAND gate	41844	01295	5440
U5	Same as U2			

R-846A RECEIVER PARTS LIST - Continued

Reference Designation	Description	Part Number	Manufacturer & Part No.	
N DIVIDER MODULE A6 (Part No. 41154-0001) - Continued				
U6	Same as U3			
U7	Same as U3			
U8	Same as U2			
U9	Same as U3			
U10	INTEGRATED CIRCUIT, 8-input NAND gate	41845	01295	SN7430N
U11	INTEGRATED CIRCUIT, Master-slave, flip-flop	41843	01295	SN7476N
U12	Same as U3			
W1	CABLE, RF	18327		
VCO MODULE A7 (Part No. 41150-0001)				
C1	CAPACITOR, Fixed, mica, selected value: 39-82 pF ±10%, 50 Vdc	41916-XXXX	72136	
C2	Same as C1			
C3	CAPACITOR, Fixed, ceramic, selected value: 56-82 pF ±5%, 75 Vdc	30429-XXXX	15450	
	CAPACITOR, Fixed, ceramic, selected value: 91-120 pF ±5%, 500 Vdc	27698-XXXX	15450	
C4	CAPACITOR, Variable, 4.5-20 pF ±10%, 160 Vdc	34676-0004	28965	7S-TR1K0-02
C5	Same as C4			
C6	Same as C4			
C7	CAPACITOR, Fixed, mylar, 0.1 μF ±10%, 80 Vdc	32423-9102	56289	192P
C8	Same as C7			
C9	CAPACITOR, Fixed, mica, 1500 pF ±20%, 200 Vdc	40632-2152	54753	SRDM19
C10	CAPACITOR, Fixed, mica, 910 pF ±2%, 500 Vdc	40632-2911	54753	SRDM19
C11	Same as C10			
C12	CAPACITOR, Fixed, mica, 33 pF ±5%, 100 Vdc	36245-0330	72136	
C13	Same as C7			
C14	NOT USED			
C15	CAPACITOR, Fixed, tantalum, 15 μF ±20%, 20 Vdc	40248-2213	56289	196D156X-0020KA1
C16	CAPACITOR, Fixed, mica, 10 pF ±10%, 50 Vdc	37967-0100	72136	
C17	CAPACITOR, Fixed, ceramic, 100 pF ±10%, 200 Vdc	28448-0101	15450	
C18	CAPACITOR, Fixed, tantalum, 1.0 μF ±20%, 35 Vdc	40248-2074	56289	196D105X-0035HA1
C19	Same as C18			
C20	NOT USED			
C21	CAPACITOR, Fixed, ceramic, .01 μF ±20%, 18 Vdc	41915-0103	15450	
C22-C24	Same as C21			
C25	Same as C18			
C26	CAPACITOR, Fixed, tantalum, 4.7 μF ±20%, 10 Vdc	40248-2106	56289	196D475X-0010HA1
C27-C30	NOT USED			
C31	Same as C7			
CR1	SEMICONDUCTOR DEVICE, Diode (Selected)	41075-0001 41075-0002 41075-0003 41075-0004 41075-0005		

R-846A RECEIVER PARTS LIST - Continued

Reference Designation	Description	Part Number	Manufacturer Part No.	
VCO MODULE A7 (Part No. 41150-0001) - Continued				
L1	INDUCTOR, Variable, 60 μH	41033-0006	54753	EX22635
L2	INDUCTOR, Bariable, 140 μH	41033-0005	54753	EX22898
L3	INDUCTOR, Variable, 500 μH	41033-0007	54753	EX22630
L4	INDUCTOR, RF, 1000 μH ±5%	34614-0102		
Q1	TRANSISTOR	36961-4124	04713	2N4124
Q2-Q4	Same as Q1			
Q5	TRANSISTOR	36269-0001	01295	SKA1455
Q6	TRANSISTOR	36962-4126	04713	2N4126
R1	RESISTOR, Fixed, comp, 330kΩ ±10%, 1/4w	200-0334	01121	CB3341
R2	Same as R1			
R3	RESISTOR, Fixed, comp, 100Ω ±10%, 1/4w	200-0101	01121	CB1011
R4	Same as R3			
R5	RESISTOR, Fixed, comp, 300Ω ±10%, 1/4w	200-0331	01121	CB3311
R6	Same as R5			
R7	Same as R1			
R8	Same as R1			
R9	RESISTOR, Fixed, comp, 100kΩ ±10%, 1/4w	200-0104	01121	CB1041
R10	RESISTOR, Fixed, comp, 27kΩ ±10%, 1/4w	200-0273	01121	CB2731
R11	RESISTOR, Fixed, comp, 470Ω ±10%, 1/4w	200-0471	01121	CB4711
R12	RESISTOR, Fixed, comp, 47kΩ ±10%, 1/4w	200-0473	01121	CB4731
R13	RESISTOR, Fixed, comp, 4700Ω ±10%, 1/4w	200-0472	01121	CB4721
R14	NOT USED			
R15	RESISTOR, Fixed, comp, 680Ω ±10%, 1/4w	200-0681	01121	CB6811
R16	RESISTOR, Fixed, comp, 10kΩ ±10%, 1/4w	200-0103	01121	CB1031
R17	RESISTOR, Fixed, comp, 2200Ω ±10%, 1/4w	200-0222	01121	CB2221
R18	RESISTOR, Fixed, comp, Selected value	200-XXXX		
R19	RESISTOR, Fixed, comp, 82kΩ ±10%, 1/4w	200-0823	01121	CB8231
R20	RESISTOR, Fixed, comp, 560Ω ±10%, 1/4w	200-0561	01121	CB5611
R21	RESISTOR, Fixed, comp, 1kΩ ±10%, 1/4w	200-0102	01121	CB1021
R22	RESISTOR, Fixed, comp, 200Ω ±5%, 1/4w	341-0301	01121	CB3015
R23	RESISTOR, Fixed, comp, 56Ω ±10%, 1/4w	200-0560	01121	CB5601
R24	RESISTOR, Fixed, comp, 2200Ω ±10%, 1/4w	200-0222	01121	CB2221
R25	Same as R24			
R26	NOT USED			
R27	RESISTOR, Fixed, comp, 100kΩ ±10%, 1/4w	200-0104	01121	CB1041
U1	INTEGRATED CIRCUIT, Linear amplifier	40563	04713	MC1550G
U2	INTEGRATED CIRCUIT, Operational amplifier	38941-3037	86684	CA3037
CHASSIS ASSEMBLY A8 (No Number)				
C1	CAPACITOR, Fixed, mica, 20 pF ±10%, 50 Vdc	37967-0200	72136	Style 5
C2	CAPACITOR, Fixed, ceramic, 0.1 μF ±20%, 18 Vdc	41915-0104	15450	Type X5F
C3-C14	Same as C2			
FL1	FILTER, RF	31161-0001	56289	2JX47
J1	CONNECTOR, Receptacle, electrical	11338		

R-846A RECEIVER PARTS LIST - Continued

Reference Designation	Description	Part Number	Manufacturer & Part No.
CHASSIS ASSEMBLY A8 (No Number) - Continued			
J2	CONNECTOR, Receptacle, electrical	33871-1003	
J3	CONNECTOR, Receptacle, electrical	35860-0150	
Q1	TRANSISTOR	41123-0008	
R1	RESISTOR, Fixed, WW, 150Ω±3%, 50W	211-0150	91637 Type RH-50

C-846A CONTROL UNIT PARTS LIST

Figure & Index No.	Part Number	Description 1 2 3 4 5 6	Qty per Assy
6-1-	40220	CONTROL UNIT ASSEMBLY, C-846A	1
-1	40222-0001	. PLATE, Identification	1
		(ATTACHING PARTS)	
-2	8956-2010	. SCREW, Tapping, thd forming, stl, blk oxidized, No. 2 by 5/32 in. lg (45722 Type Z)	2
		---*---	
-3	41938	. COVER ASSEMBLY	1
		(ATTACHING PARTS)	
-4	104-0016	. SCREW, Machine, bind hd, brs, ni pl, No. 4-40 thd by 1/4 in. lg	2
		---*---	
-5	41629	. KNOB	1
		(ATTACHING PARTS)	
-6	324-4008	. SETSCREW, Hex soc dr, cup pt, stl, No. 4-40 thd by 1/8 in. lg	2
		---*---	
-7	41764-0032	. KNOB	1
-8	41765-0000	. KNOB	1
		(ATTACHING PARTS FOR INDEX NUMBERS 7 AND 8)	
-9	324-4012	. SETSCREW, Hex soc dr, cup pt, stl, No. 4-40 thd by 3/16 in. lg	2
		---*---	
-10	41764-0032	. KNOB	1
		(ATTACHING PARTS)	
-11	324-4012	. SETSCREW, Hex soc dr, cup pt, stl, No. 4-40 thd by 3/16 in. lg	2
		---*---	
-12	28476-0012	. RING, Retaining	1
-13	41765-0001	. KNOB	1
		(ATTACHING PARTS)	
-14	324-4012	. SETSCREW, Hex soc dr, cup pt, stl, No. 4-40 thd by 3/16 in. lg	2
		---*---	
-15	42039	. KNOB ASSEMBLY	1
		(ATTACHING PARTS)	
-16	324-4008	. SETSCREW, Hex soc dr, cup pt, stl, No. 4-40 thd by 1/8 in. lg	2
		---*---	
-17	42037-0001	. PANEL ASSEMBLY	1
		(ATTACHING PARTS)	
-18	113-0024	. SCREW, Machine, bind hd, brs, blk oxidized, No. 3-48 thd by 1/2 in. lg	2
-19	13473	. WASHER, Flat	2
		---*---	
-20	42038	. . WINDOW ASSEMBLY	1
-21	41784-0000	. . PANEL, Plastic, printed	1
-22	32905-0000	. BUTTON, Acrylic, red	1
-23	14562	. EMBLEM	1
		(ATTACHING PARTS)	
-24	8040	. NUT, Hexagon, brs, ni pl, No. 4-40 thd	1
-25	14680	. WASHER, Flat	1
		---*---	
-26	42045	. PRINTED WIRING ASSEMBLY	1
-27	36183-0002	. . FILTER, Lamp, blue (22921 type D150)	6
-28	32971-0003	. . LAMP, Incandescent, clear, 5 V, 0.115 A (71744 part No. 715) (DS1-DS6)	6
-29	41833	. . BOARD, Printed wiring	1
-30	27029	. PLATE, Adapter	1
		(ATTACHING PARTS)	
-31	154-0016	. SCREW, Machine, fh, brs, blk oxidized, No. 4-40 thd by 1/4 in. lg	4
		---*---	
-32	32935-0000	. SWITCH, Push, SPST, 115 V, 5A (81073 part no. 39-1) (S6)	1
		(ATTACHING PARTS)	
-33	-	. NUT, Hexagon (supplied with 32935-0000)	1
		---*---	

C-846A CONTROL UNIT PARTS LIST

Figure & Index No.	Part Number	Description 1 2 3 4 5 6	Qty per Assy
6-1-34	41761	. SWITCH, Rotary, 3 positions, non-shorting (82104 type 1210SM) (S4)	1
		(ATTACHING PARTS)	
-35	-	. NUT, Hexagon (supplied with 41761)	1
-36	-	. WASHER, Lock (supplied with 41761)	1
		---*---	
-37	42046	. PLATE ASSEMBLY	1
		(ATTACHING PARTS)	
-38	144-0012	. SCREW, Machine, fh, brs, ni pl, No. 4-40 thd by 3/16 in. lg	1
		---*---	
-39	26633-0011	. BEARING (01471 part no. 2L1-FF)	2
-40	26633-0001	. BEARING (01471 part no. 4L1-FF)	1
-41	34614-1102	. COIL, RF, 1000 H ±10% (L1)	1
-42	40248-1213	. CAPACITOR, Fixed, tantalum, 15 μF ±10%, 20 Vdc (56289 type 196D) (C1)	1
-43	50184-0007	. TERMINAL, Strip (83330 part no. 1064) (TB1)	1
		(ATTACHING PARTS)	
-44	102-0016	. SCREW, Machine, bind hd, brs, ni pl, No. 2-56 thd by 1/4 in. lg	1
-45	4386	. WASHER, Lock	1
-46	8275	. NUT, Hexagon, brs, ni pl, No. 2-56 thd	1
		---*---	
-47	35862-0002	. GUIDE, Pin (81312 type G700)	1
		(ATTACHING PARTS)	
-48	-	. NUT, Hexagon (supplied with 36862-0002)	1
-49	-	. WASHER, Lock (supplied with 35862-0002)	1
		---*---	
-50	35862-0001	. GUIDE, Socket (81312 type G700)	1
		(ATTACHING PARTS)	
-51	-	. NUT, Hexagon (supplied with 53862-0001)	1
-52	-	. WASHER, Lock (supplied with 35862-0001)	1
		---*---	
-53	35860-0134	. CONNECTOR BODY, Receptacle, electrical (81312 part No. MRAC 34P) (J1)	1
		(ATTACHING PARTS)	
-54	164-0024	. SCREW, Machine, fil hd, brs, ni pl, No. 4-40 thd by 3/8 in. lg	4
-55	8040	. NUT, Hex, brs, ni pl, No. 4-40 thd	4
-56	22341	. WASHER, Lock, split, sst, No. 4	4
-57	15155	. WASHER, Flat	4
		---*---	
-58	35861-0122	. CONTACT, Electrical (81312 part no. 100-1022P)	34
-59	29916-0001	. LOCK, Tab, connector (81312 part no. MRE-V)	2
-60	42053	. PLATE ASSEMBLY	1
		(ATTACHING PARTS)	
-61	104-0016	. SCREW, Machine, bind hd, brs, ni pl, No. 4-40 thd by 1/4 in. lg	4
-62	22341	. WASHER, Lock, spring tension	4
		---*---	
-63	41775-0000	. POST, Threaded	4
		(ATTACHING PARTS)	
-64	8040	. NUT, Hexagon, brs, ni pl, No. 4-40 thd	4
-65	22341	. WASHER, Lock, spring tension	4
		---*---	
-66	41728	. GEAR, Spur	1
		(ATTACHING PARTS)	
-67	304-0008	. SETSCREW, Spline soc dr, cup pt, stl, cad pl, No. 4-40 thd by 1/8 in. lg	2
		---*---	

C-846A CONTROL UNIT PARTS LIST

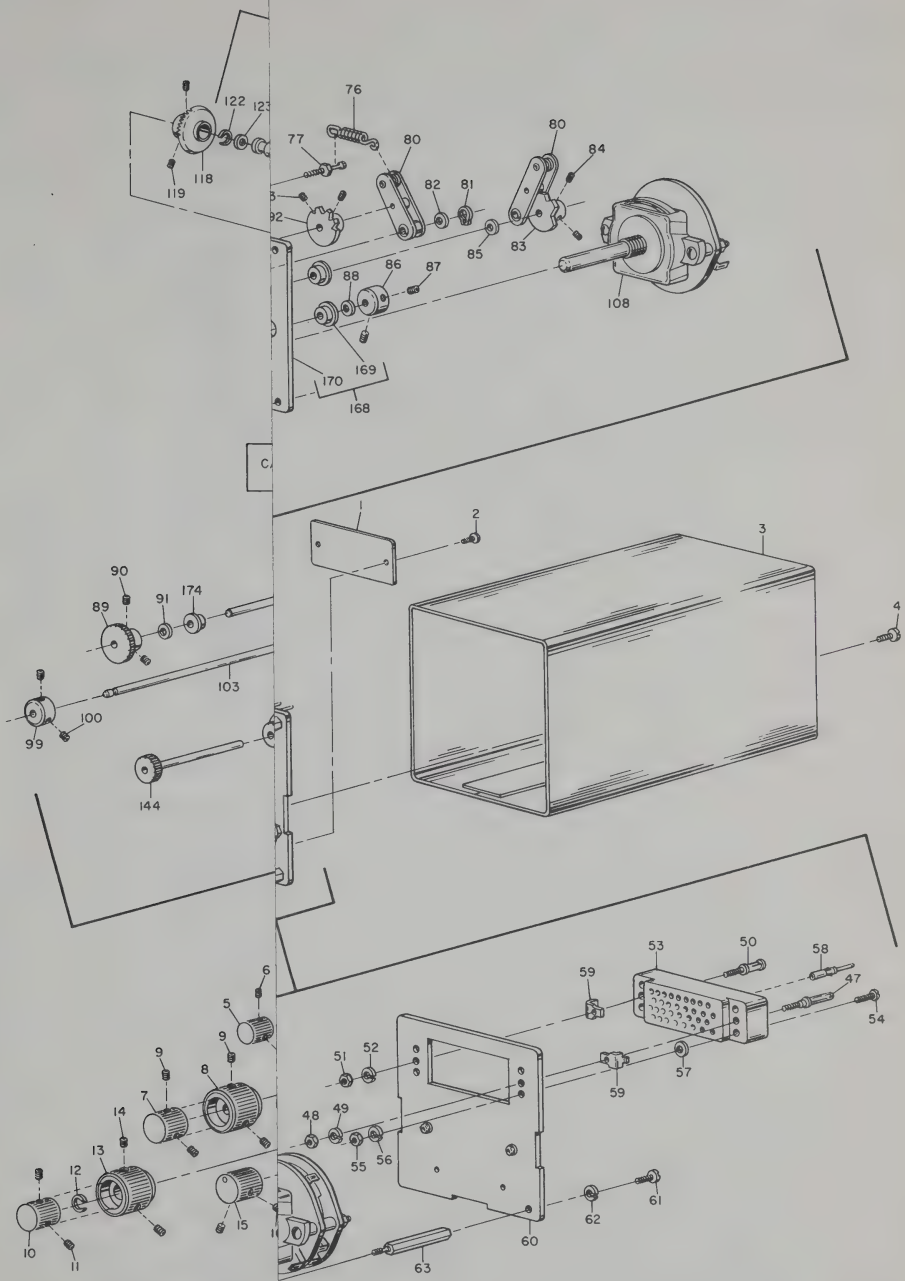
Figure & Index No.	Part Number	Description 1 2 3 4 5 6	Qty per Assy
6-1-68	41762	. SWITCH, Rotary, 20 positions, shorting (76854 type RK) (S1)	1
		(ATTACHING PARTS)	
-69	-	. NUT, Hexagon (supplied with 41762)	1
		---*---	
-70	41745	. GEAR, Spur	1
		(ATTACHING PARTS)	
-71	8040	. NUT, Hexagon, brs, ni pl, No. 4-40 thd	1
-72	22341	. WASHER, Lock, spring tension	1
-73	13046	. WASHER, Flat	1
-74	28476-0018	. RING, Retaining (79136 Part no. 5103-18-MD)	1
		---*---	
-75	41746	. SHAFT	1
-76	33192	. SPRING, Helical, extension	2
-77	17400	. TERMINAL, Threaded	2
		(ATTACHING PARTS)	
-78	4561	. NUT, Hexagon, brs, ni pl, No. 3-48 thd	2
-79	4558	. WASHER, Lock, int tooth (78189 type 1903)	2
		---*---	
-80	33165	. STRAP ASSEMBLY	2
		(ATTACHING PARTS)	
-81	28665-0012	. RING, Retaining (79136 part no. 5100-12-C)	2
-82	17768-0000	. WASHER, Flat	AR
		---*---	
-83	42074	. CAM	1
		(ATTACHING PARTS)	
-84	304-0006	. SETSCREW, Spline soc dr, cup pt, stl, cad pl, No. 4-40 thd by 3/32 in. lg	2
-85	17768-0000	. WASHER, Flat	AR
-86	27790	. COLLAR	1
		(ATTACHING PARTS)	
-87	304-0008	. SETSCREW, Spline soc dr, cup pt, stl, cad pl, No. 4-40 thd by 1/8 in. lg	2
-88	17768-0000	. WASHER, Flat	AR
		---*---	
-89	41737	. GEAR, Spur	1
		(ATTACHING PARTS)	
-90	302-0006	. SETSCREW, Spline soc dr, cup pt, stl, cad pl, No. 2-56 thd by 3/32 in. lg	2
-91	17768-0000	. WASHER, Flat	AR
		---*---	
-92	42073	. CAM	1
		(ATTACHING PARTS)	
-93	304-0006	. SETSCREW, Spline soc dr, cup pt, stl, cad pl, No. 4-40 thd by 3/32 in. lg	2
		---*---	
-94	42050	. GEAR ASSEMBLY	1
		(ATTACHING PARTS)	
-95	302-0006	. SETSCREW, Spline soc dr, cup pt, stl, cad pl, No. 2-56 thd by 3/32 in. lg	2
-96	41747	. SHAFT	1
		(ATTACHING PARTS)	
-97	28476-0012	. RING, Retaining (79136 part no. 5103-12-MD).	1
-98	17768-0000	. WASHER, Flat	AR
		---*---	
-99	27790	. COLLAR	1
		(ATTACHING PARTS)	
-100	304-0008	. SETSCREW, Spline soc dr, cup pt, stl, cad pl, No. 4-40 thd by 1/8 in. lg	2
		---*---	

C-846A CONTROL UNIT PARTS LIST

Figure & Index No.	Part Number	Description 1 2 3 4 5 6	Qty per Assy
6-1-101	42048	GEAR ASSEMBLY	1
		(ATTACHING PARTS)	
-102	304-0006	SETSCREW, Spline soc dr, cup pt, stl, cad pl, No. 4-40 thd by 3/32 in. lg	2
		---*---	
-103	41749	SHAFT	1
		(ATTACHING PARTS)	
-104	28476-0012	RING, Retaining (79136 part no. 5103-12-MD)	1
-105	17768-0000	WASHER, Flat	AR
		---*---	
-106	41728	GEAR, Spur	1
		(ATTACHING PARTS)	
-107	304-0008	SETSCREW, Spline soc dr, cup pt, stl, cad pl, No. 4-40 thd by 1/8 in. lg	2
		---*---	
-108	41763	SWITCH, Rotary, 20 positions, shorting (76854 type RK) (S3)	1
		(ATTACHING PARTS)	
-109	-	NUT, Hexagon (supplied with 41763)	1
		---*---	
-110	40178-0004	RESISTOR, Variable, comp, 5kΩ±30%, 1/4w, with SPST switch (R1, S5)	1
		(ATTACHING PARTS)	
-111	-	NUT, Hexagon (supplied with 40178-0004)	1
-112	-	WASHER, Lock (supplied with 40178-0004)	1
		---*---	
-113	33138-0055	BEARING (12639 part no. 127-55)	5
		(ATTACHING PARTS)	
-114	28476-0012	RING, Retaining (79136 part no. 5103-12-MD)	2
-115	17768-0000	WASHER, Flat	AR
		---*---	
-116	41726	GEAR ASSEMBLY (09109 part no. 90-6448YB281)	1
		(ATTACHING PARTS)	
-117	302-0006	SETSCREW, Spline soc dr, cup pt, stl, cad pl, No. 2-56 thdy by 3/32 in. lg.	2
		---*---	
-118	41727	GEAR ASSEMBLY (09109 part no. 90-6448YB281)	2
		(ATTACHING PARTS)	
-119	304-0006	SETSCREW, Spline soc dr, cup pt, stt, cad pl, No. 4-40 thd by 3/32 in. lg	4
		---*---	
-120	42282	COUNTER ASSEMBLY	1
-121	41948	. WHEEL ASSEMBLY, Printed	1
		(ATTACHING PARTS)	
-122	28476-0012	. RING, Retaining (79136 part no. 5103-12-MD)	1
-123	17768-0000	. WASHER, Flat	AR
		---*---	
-124	41733	. . WHEEL, Counter	1
-125	41773	. . SHAFT	1
-126	17768-0000	. WASHER, Flat	AR
-127	41949	. WHEEL ASSEMBLY, Printed	1
		(ATTACHING PARTS)	
-128	28476-0012	. RING, Retaining (79136 part no. 5103-12-MD)	1
-129	17768-0000	. WASHER, Flat	AR
		---*---	
-130	40956-0001	. . WHEEL, Counter	1
-131	41768	. . SHAFT	1
-132	17768-0000	. WASHER, Flat	AR
-133	41729	. WHEEL ASSEMBLY, Printed	1
-134	40956-0000	. . WHEEL, Counter	1
-135	41774	. . SHAFT	1

C-846A CONTROL UNIT PARTSLIST

Figure & Index No.	Part Number	Description 1 2 3 4 5 6	Qty per Assy
6-1-136	41745	. GEAR, Spur	1
		(ATTACHING PARTS)	
-137	8040	. NUT, Hexagon, brs, ni pl, No. 4-40 thd	1
-138	22341	. WASHER, Lock, spring tension	1
-140	28476-0018	. RING, Retaining (79136 part no. 5103-18-MD)	1
		---*---	
-141	41746	. SHAFT	1
-142	42050	. GEAR ASSEMBLY	1
		(ATTACHING PARTS)	
-143	302-0006	. SETSCREW, Spline soc dr, cup pt, stl, cad pl, No. 2-56 thd by 3/32 in. lg	2
		---*---	
-144	42055	. GEAR AND SHAFT ASSEMBLY	1
-145	42049	. GEAR ASSEMBLY	1
-146	17768-0000	. WASHER, Flat	AR
-147	42048	. GEAR ASSEMBLY	1
		(ATTACHING PARTS)	
-148	304-0006	. SETSCREW, Spline soc dr, cup pt, stl, cad pl, No. 4-40 thd by 3/32 in. lg	2
		---*---	
-149	41748	. SHAFT	1
-150	42052	. PLATE ASSEMBLY	1
		(ATTACHING PARTS)	
-151	8040	. NUT, Hexagon, brs, ni pl, No. 4-40 thd	4
-152	22341	. WASHER, Lock, split, sst, No. 4	4
-153	2544	. TERMINAL, Lug	2
		---*---	
-154	33138-0055	. . BEARING, Flanged (12639 part no. 127-55)	2
-155	41778	. . PLATE	1
-156	41745	. GEAR, Spur	1
		(ATTACHING PARTS)	
-157	8040	. NUT, Hexagon, brs, ni pl, No. 4-40 thd	1
-158	22341	. WASHER, Lock, spring tension	1
-159	13046	. WASHER, Flat	1
-160	28476-0018	. RING, Retaining (79136 part no. 5103-18-MD)	1
		---*---	
-161	41746	. SHAFT	1
-162	42054	. GEAR AND PINION ASSEMBLY	1
-163	41728	. GEAR, Spur	1
		(ATTACHING PARTS)	
-164	304-0008	. SETSCREW, Spline soc dr, cup pt, stl, cad pl, No. 4-40 thd by 1/8 in. lg	2
		---*---	
-165	41736	. SWITCH, Rotary, 20 positions, shorting (76854 type RK) (S2)	1
		(ATTACHING PARTS)	
-166	-	. NUT, Hexagon (supplied with 41763)	1
		---*---	
-167	41775-0001	. POST, Threaded	4
-168	42051	. PLATE ASSEMBLY	1
-169	33138-0055	. . BEARING (12639 part no. 127-55)	2
-170	41778	. . PLATE	1
-171	41775-0001	. POST, Threaded	4
-172	41775-0002	. POST, Threaded	4
-173	42047	. BRACKET ASSEMBLY	1
-174	33138-0055	. . BEARING (12639 part no. 127-55)	2
-175	41939	. . BEARING	1
-176	33138-0115	. . BEARING (12639 part no. 127-55)	1
-177	41783	. . BRACKET	1



6-1. C-846A Control Unit, Exploded View

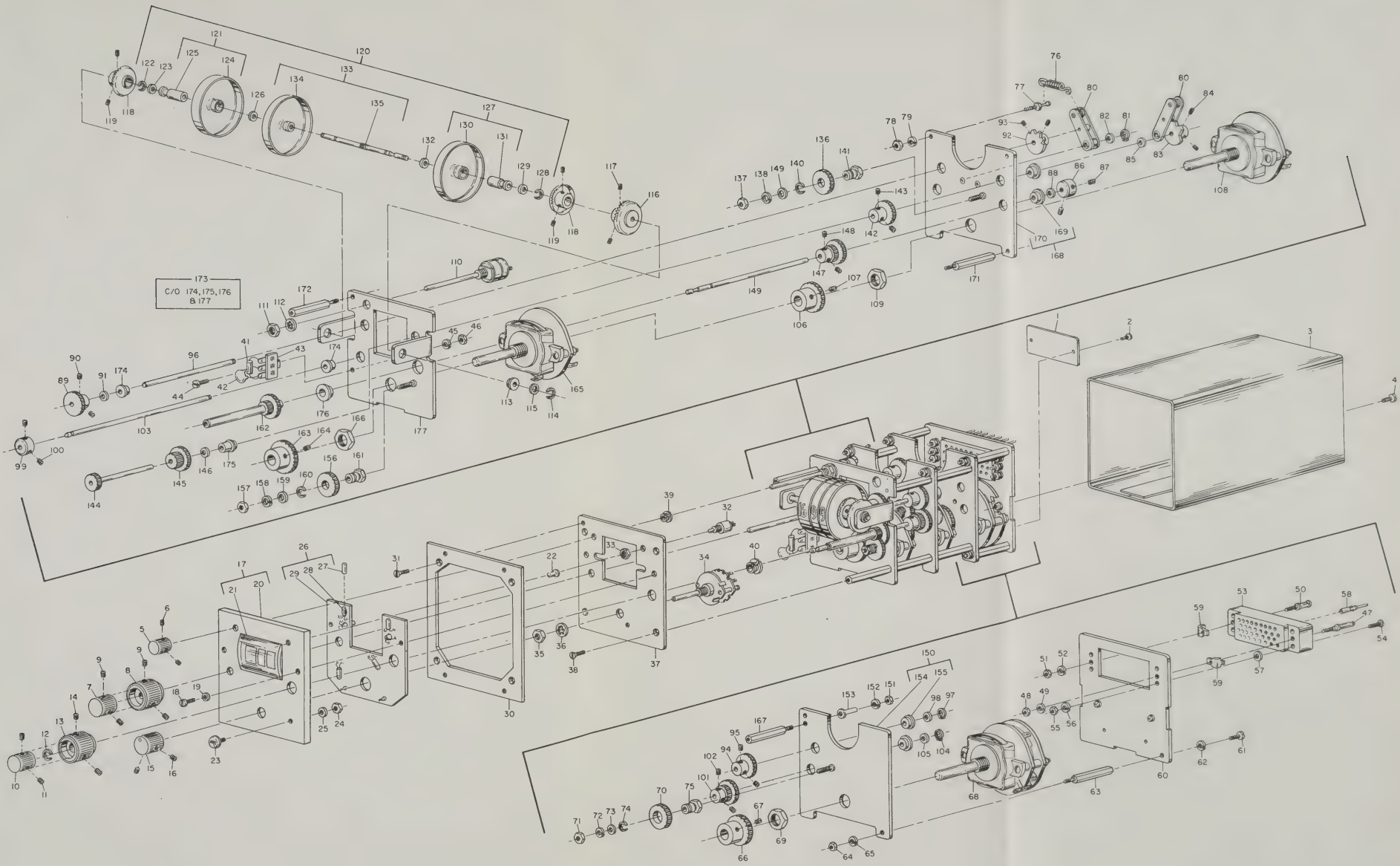


Figure 6-1. C-846A Control Unit, Exploded View

IN-346C AND IN-346D GONIOMETER-INDICATORS PARTS LIST

Figure & Index No.	Part Number	Description 1 2 3 4 5 6	Qty Per Assy
6-2-			
	41360-1001	GONIOMETER-INDICATOR ASSEMBLY, IN-346C	1
	41360-1101	GONIOMETER-INDICATOR ASSEMBLY, IN-346D	1
-1	41347-0001	. PLATE, Information	1
-2	3327	. COVER	1
		(ATTACHING PARTS)	
-3	514-0016	. SCREW, Assembled washer, bind hd, brs screw, sst lockwasher, blk oxidized No. 4-40 thd by 1/4 in. lg (78189 type SEMS)	2
		---*---	
-4	35860-0118	. CONNECTOR BODY, Receptacle, electrical (J2)	1
		(ATTACHING PARTS)	
-4A	-	. NUT, Hexagon (supplied with 35862-0001 and -0002)	2
-4B	-	. WASHER, Lock (supplied with 35862-0001 and -0002)	2
-5	35862-0002	. GUIDE, Pin	1
-6	35862-0001	. GUIDE, Socket	1
-7	29916-0001	. TABS, Lock (1 set)	1
		---*---	
-8	35861-0122	. CONTACT, Electrical	16
-9	35861-0118	. CONTACT, Electrical	2
-10	31169-0000	. CONNECTOR, Receptacle, electrical (J1) (MS310R16S-1P)	1
		(ATTACHING PARTS)	
-11	504-0024	. SCREW, Assembled washer, bind hd, ni pl, brs screw, sst lockwasher No. 4-40 thd by 3/8 in. lg (78189 type SEMS)	4
		---*---	
-12	41361-1001	. PLATE, Identification	1
			1
-12	41361-1101	. PLATE, Identification	1
-13	41291	. PLATE ASSEMBLY	1
		(ATTACHING PARTS)	
-14	144-0016	. SCREW, Machine, fh, brs, ni pl, No. 4-40 thd by 1/4 in. lg	1
-15	8775-0016	. PIN, Spring (MS171432)	2
		---*---	
-16	33281-0001	. PLATE, Printed	1
		(ATTACHING PARTS)	
-17	504-0040	. SCREW, Assembled washer, bind hd, ni pl, brs screw, sst lockwasher No. 4-40 thd by 5/8 in. lg (78189 type SEMS)	3
-18	104-0040	. SCREW, Machine, bind hd, brs, ni pl, No. 4-40 thd by 5/8 in. lg	1
-19	8927-0004	. TERMINAL, Lug, locking	1
		---*---	
-20	29609-0026	. SPACER	4
-21	33273	. BLOCK	1
		(ATTACHING PARTS)	
-22	504-0016	. SCREW, Assembled washer, bind hd, ni pl, brs screw, sst lockwasher No. 4-40 thd by 1/4 in. lg (78189 type SEMS)	2
		---*---	
-23	33245-0001	. CAM ASSEMBLY	1
		(ATTACHING PARTS)	
-24	504-0016	. SCREW, Assembled washer, bind hd, ni pl, brs screw, sst lockwasher No. 4-40 thd by 1/4 in. lg (78189 type SEMS)	2
		---*---	
-25	20097-0134	. POST	1
		(ATTACHING PARTS)	
-26	504-0016	. SCREW, Assembled washer, bind hd, ni pl, brs screw, sst lockwasher No. 4-40 thd by 1/4 in. lg (78189 type SEMS)	
		---*---	

IN-346C AND IN-346D GONIOMETER-INDICATORS PARTS LIST

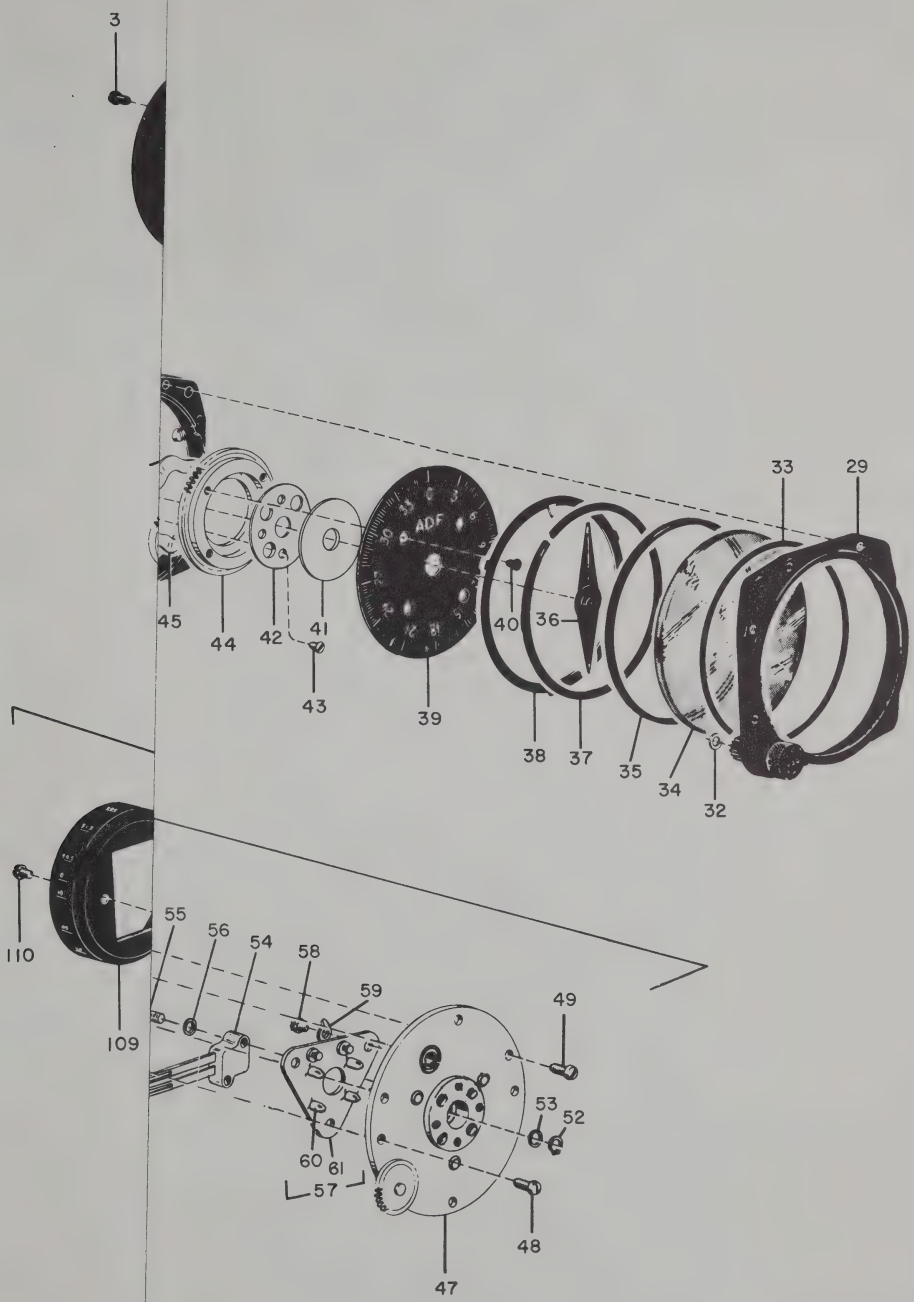
Figure & Index No.	Part Number	Description	Qty Per Assy
6-2-27	33228	FIDUCIAL	1
		(ATTACHING PARTS)	
-28	502-0016	SCREW, Assembled washer, bind hd ni pl, brs screw, sst lockwasher No. 2-56 by 1/4 in. lg (78189 type SEMS)	2
		---*---	
-29	33076	FLANGE ASSEMBLY	1
		(ATTACHING PARTS)	
-30	174-0028	SCREW, Machine, fil h, brs, blk oxidized, No. 4-40 thd by 7/16 in. lg	8
-31	29519	WASHER, Lock, split, stl, cad pl, No. 4	8
		---*---	
-32	11816	WASHER, Spring tension	1
-33	20249	WASHER	1
-34	26050	WINDOW	1
-35	20250	GASKET (39944 part no. 611KN-27)	1
-36	34147-0003	POINTER ASSEMBLY	1
-37	20261	RING, Snap	1
-38	34153	MASK, Painted	1
-39	34140-0002	DIAL	1
		(ATTACHING PARTS)	
-40	152-0012	SCREW, Machine, bind, hd, brs, blk oxidized, No. 2-56 by 3/16 in lg	4
		---*---	
-41	39021-0002	PLATE, Filter (blue)	1
-42	35156-0002	PLATE	1
		(ATTACHING PARTS)	
-43	142-0016	SCREW, Machine, fh, brs, ni pl, No. 2-56 thd by 1/4 in. lg	4
		---*---	
-44	34144	GEAR, Spur	1
-45	33083	WASHER, Formed	1
-46	41306-0000	GEARING UNIT ASSEMBLY - IN-346C	1
-46	41306-0001	GEARING UNIT ASSEMBLY - IN-346D	1
-47	33084-0002	. PLATE ASSEMBLY	1
		(ATTACHING PARTS)	
-48	104-0020	. SCREW, Machine, bind hd, brs, ni pl, No. 4-40 thd by 5/16 in. lg	3
-49	104-0024	. SCREW, Machine, bind hd, brs, ni pl, No. 4-40 by 3/8 in. lg	3
		---*---	
-50	34155	. FLANGE	1
-51	33089	. GEAR ASSEMBLY	1
		(ATTACHING PARTS)	
-52	28665-0012	. RING, Retaining (79136 part no. 5100-12-C)	1
-53	17758-0000	. WASHER, Flat	AR
		---*---	
-54	41302	. CONTACT ASSEMBLY, Molded	1
		(ATTACHING PARTS)	
-55	102-0032	. SCREW, Machine, bind hd, brs, ni pl, No. 2-56 thdy by 1/2 in. lg	2
-56	4386	. WASHER, Lock, split, brs, ni pl, No. 2	2
		---*---	
-57	39091	. PRINTED CIRCUIT ASSEMBLY	1
		(ATTACHING PARTS)	
-58	502-0012	. SCREW, Assembled washer, bind hd, ni pl, brs screw, sst lockwasher No. 2-56 thd by 3/16 in. lg	3
-59	3873	. TERMINAL	1
		---*---	

IN-346C AND IN-346D GONIOMETER-INDICATORS PARTS LIST

Figure & Index No.	Part Number	Description (1 2 3 4 5 6)	Qty Per Assy
6-2-60	39013-2182	. . . LAMP, Incandescent, 14 V (08806 part no. 2182D-FROSTED)	4
-61	39090	. . . PRINTED CIRCUIT SUBASSEMBLY	1
-62	7117-0000	. . WASHER, Flat	AR
-63	28665-0018	. . RING, Retaining (79136 part no. 5100-18-C)	1
-64	33270	. . GEAR ASSEMBLY	1
		(ATTACHING PARTS)	
-65	302-0006	. . SETSCREW, Spline soc dr, cup pt, stl, cad pl, No. 2-56 thd by 3/32 in. lg	2
		---*---	
-66	41303	. . CONTACT PLATE ASSEMBLY	1
		(ATTACHING PARTS)	
-67	304-0006	. . SETSCREW, Spline soc dr, cup pt, stl, cad pl, No. 4-40 thd by 3/32 in. lg	2
		---*---	
-68	33093	. . POST	3
-69	33148	. . GEAR ASSEMBLY	1
		(ATTACHING PARTS)	
-70	302-0006	. . SETSCREW, Spline soc dr, cup pt, stl, cad pl, No. 2-56 thd by 3/32 in. lg	2
		---*---	
-71	33129	. . GEAR ASSEMBLY	1
-72	33127	. . GEAR ASSEMBLY	1
-73	33694	. . GEAR ASSEMBLY	1
-74	30087	. . GEAR ASSEMBLY - IN-346D	1
		(ATTACHING PARTS)	
-75	304-0006	. . SETSCREW, Spline soc dr, cup pt, stl, cad pl, No. 4-40 thd by 3/32 in. lg	2
		---*---	
-76	14591	. . WASHER, Flat	AR
-77	40963	. . MOTOR, Control	1
		(ATTACHING PARTS)	
-78	163-0020	. . SCREW, Machine, fil hd, brs, ni pl, No. 3-48 thd by 5/16 in. lg	2
-79	4559	. . WASHER, Lock, split, brz, ni pl, No. 3	2
-80	38409-0002	. . CLAMP, Rim clenching	2
-81	4644	. . WASHER	2
		---*---	
-82	37483-0001	. . GONIOMETER, Electrical (28308 part no. 10Hew0101/B05/0216)	1
		(ATTACHING PARTS)	
-83	163-0024	. . SCREW, Machine, fil hd, brs, ni pl, No. 3-48 thd by 3/8 in. lg	3
-84	4559	. . WASHER, Lock, split, brz, ni pl, No. 3	3
-85	26804-0000	. . CLAMP, Rim clenching	3
-86	26805-0004	. . SPACER, Sleeve	3
		---*---	
-87	18008	. . SYNCHRO, Transmitter, 26 V, 400 Hz, 13 V, 100 Hz (88818 part no. RS911-4A) - IN-346D	1
		(ATTACHING PARTS)	
-88	163-0020	. . SCREW, Machine, fl hd, brs, ni pl, No. 3-48 thd by 5/16 in. lg	2
-89	4559	. . WASHER, Lock, split brz, ni pl, No. 3	2
-90	4664	. . WASHER	2
-91	26804-0000	. . CLAMP, Rim clenching	2
-92	26805-0002	. . SPACER, Sleeve	2
		---*---	

IN-346C AND IN-346D GONIOMETER-INDICATORS PARTS LIST

Figure & Index No.	Part Number	Description	Qty Per Assy
6-2-93	33489-0002	PLATE ASSEMBLY, Front	1
-94	33227	GEAR, Spur	1
		(ATTACHING PARTS)	
-95	302-0006	SETSCREW, Spline soc dr, cup pt, stl, cad pl, No. 2-56 thd by 3/32 in. lg	2
		---*---	
-96	33152	GEAR ASSEMBLY	1
		(ATTACHING PARTS)	
-97	302-0006	SETSCREW, Spline soc dr, cup pt, stl, cad pl. No. 2-56 thd by 3/32 in. lg	2
		---*---	
-98	33094	POST	3
-99	33243	POST	4
-100	33205	GEARING ASSEMBLY	1
		(ATTACHING PARTS)	
-101	28665-0025	RING, Retaining (79136 part no. 5100-25-MD)	1
-102	21623	WASHER, Flat	1
		---*---	
-103	29857	ARM ASSEMBLY	1
		(ATTACHING PARTS)	
-104	102-0012	SCREW, Machine, bind hd, brs, ni pl, No. 2-56 thd by 3/16 in. lg	1
		---*---	
-105	29848	PIN, Grooved	1
		(ATTACHING PARTS)	
-106	28665-0012	RING, Retaining (79136 part no. 5100-12-C)	1
-107	17768-0000	WASHER, Flat	1
		---*---	
-108	29849	SPRING, Helical, torsion	1
-109	33248	DIAL, Printed	1
		(ATTACHING PARTS)	
-110	502-0008	SCREW, Assembled washer, bind hd, ni pl, brs screw, sst lockwasher No. 2-56 thd by 1/8 inl lg (78189 type SEMS)	2
		---*---	
-111	33207	PIN, Shoulder	1
-112	30995	WASHER, Flat	1
-113	17831	SPRING, Helical, extension	1
-114	29852	GEAR, Spur	1
-115	30314	GEAR, Spur	1
-116	30996	WASHER, Flat	1
-117	8775-0442	PIN, Spring	1
-118	32208	PLATE ASSEMBLY	1
-119	33224	GEAR ASSEMBLY	1
		(ATTACHING PARTS)	
-120	28665-0018	RING, Retaining (79136 part no. 5100-18-C)	1
-121	7117-0000	WASHER, Flat	AR
		---*---	
-122	33533-0001	PLATE ASSEMBLY, Rear	1



-346D Goniometer-Indicators, Exploded View

IN-346C AND IN-346D GONIOMETER-INDICATORS PARTS LIST

Figure & Index No.	Part Number	Description	Qty Per Assy
6-2-93	33489-0002	PLATE ASSEMBLY, Front	1
-94	33227	GEAR, Spur	1
		(ATTACHING PARTS)	
-95	302-0006	SETSCREW, Spline soc dr, cup pt, stl, cad pl, No. 2-56 thd by 3/32 in. lg	2
		---*---	
-96	33152	GEAR ASSEMBLY	1
		(ATTACHING PARTS)	
-97	302-0006	SETSCREW, Spline soc dr, cup pt, stl, cad pl. No. 2-56 thd by 3/32 in. lg	2
		---*---	
-98	33094	POST	3
-99	33243	POST	4
-100	33205	GEARING ASSEMBLY	1
		(ATTACHING PARTS)	
-101	28665-0025	RING, Retaining (79136 part no. 5100-25-MD)	1
-102	21623	WASHER, Flat	1
		---*---	
-103	29857	ARM ASSEMBLY	1
		(ATTACHING PARTS)	
-104	102-0012	SCREW, Machine, bind hd, brs, ni pl, No. 2-56 thd by 3/16 in. lg	1
		---*---	
-105	29848	PIN, Grooved	1
		(ATTACHING PARTS)	
-106	28665-0012	RING, Retaining (79136 part no. 5100-12-C)	1
-107	17768-0000	WASHER, Flat	1
		---*---	
-108	29849	SPRING, Helical, torsion	1
-109	33248	DIAL, Printed	1
		(ATTACHING PARTS)	
-110	502-0008	SCREW, Assembled washer, bind hd, ni pl, brs screw, sst lockwasher No. 2-56 thd by 1/8 inl lg (78189 type SEMS)	2
		---*---	
-111	33207	PIN, Shoulder	1
-112	30995	WASHER, Flat	1
-113	17831	SPRING, Helical, extension	1
-114	29852	GEAR, Spur	1
-115	30314	GEAR, Spur	1
-116	30996	WASHER, Flat	1
-117	8775-0442	PIN, Spring	1
-118	32208	PLATE ASSEMBLY	1
-119	33224	GEAR ASSEMBLY	1
		(ATTACHING PARTS)	
-120	28665-0018	RING, Retaining (79136 part no. 5100-18-C)	1
-121	7117-0000	WASHER, Flat	AR
		---*---	
-122	33533-0001	PLATE ASSEMBLY, Rear	1

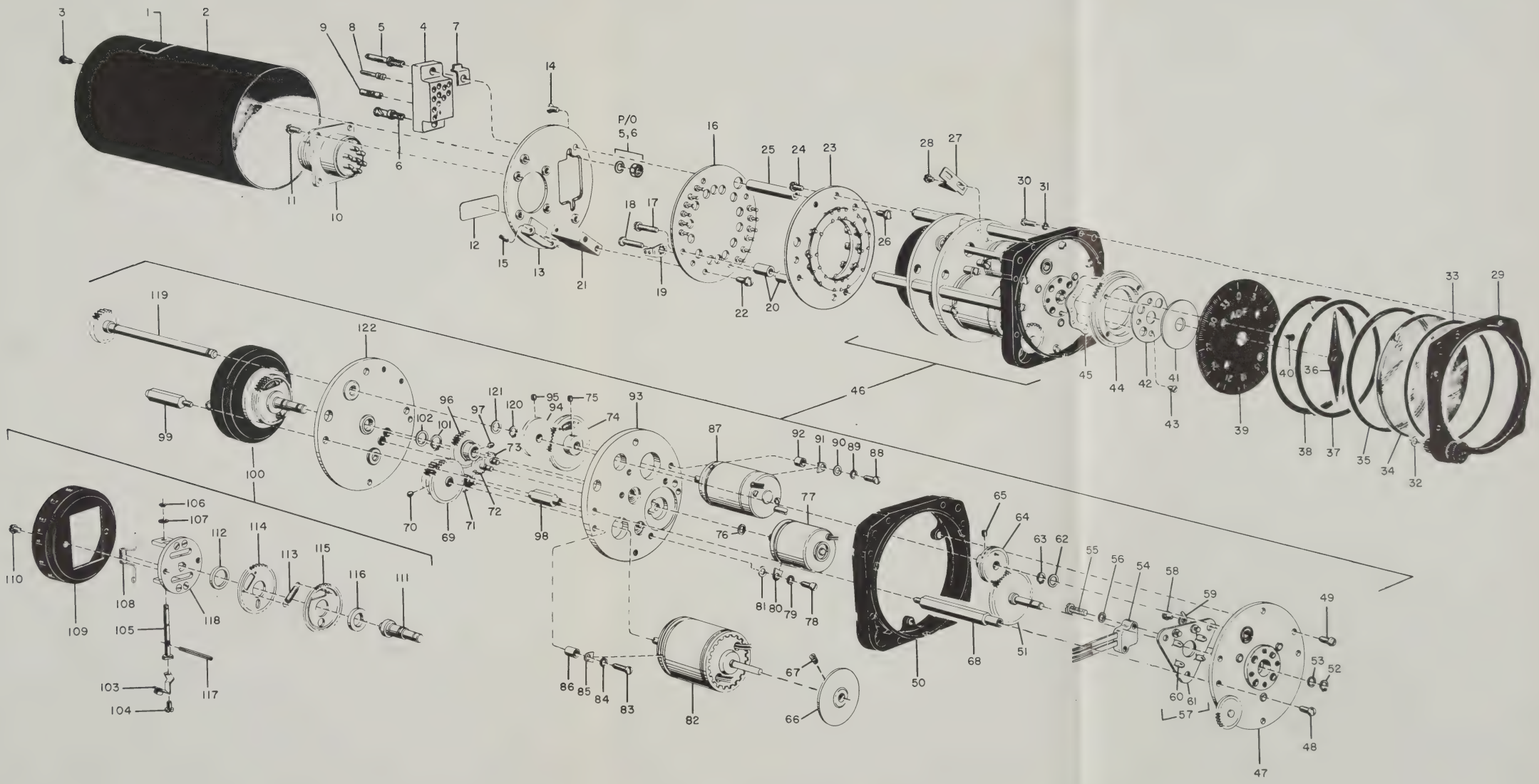


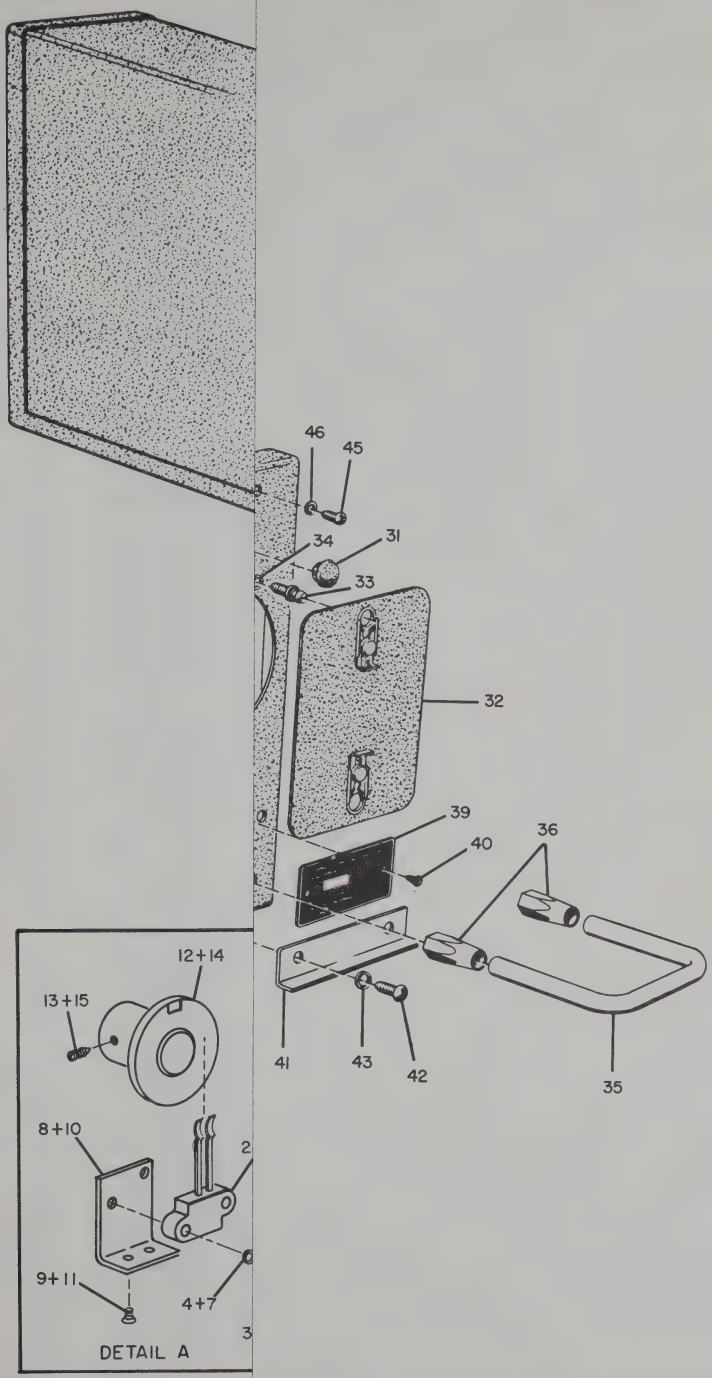
Figure 6-2. IN-346C and IN-346D Goniometer-Indicators, Exploded View

RA-346A AND RA-346B RECEIVER ACCESSORY PARTS LIST

Figure & Index No.	Part Number	Description 1 2 3 4 5 6	Qty Per Assy
6-3 -	41340-0001	RECEIVER ACCESSORY, RA-346A	1
	41340-0002	RECEIVER ACCESSORY, RA-346B	1
-1	35876-0001	. COVER ASSEMBLY	1
-2	41302	. CONTACT ASSEMBLY, Molded (Used on RA-346B)	1
		ATTACHING PARTS	
-3	102-0028	. SCREW, Machine, bind. hd, brs, ni pl, No. 2-56 thd by 7/16 in. lg (Used on RA-346B)	2
-4	4386	. WASHER, Lock, split, sst, No. 4 (Used on RA-346B)	2
		---*---	
-5	41302	. CONTACT ASSEMBLY, Molded	1
		ATTACHING PARTS	
-6	102-0028	. SCREW, Machine, bind. hd, brs, ni pl, No. 2-56 by 7/16 in. lg	2
-7	4386	. WASHER, Lock, split, sst, No. 4	2
		---*---	
-8	41353	. BRACKET (Used on RA-346B)	1
		ATTACHING PARTS	
-9	142-0012	. SCREW, Machine, fh, brs, ni pl, No. 2-56 thd by 3/8 in. lg (Used on RA-346B)	2
		---*---	
-10	41353	. BRACKET.	1
		ATTACHING PARTS	
-11	142-0012	. SCREW, Machine, fh, brs, ni pl No. 2-56 thd by 3/8 in. lg	2
		---*---	
-12	41354	. PLATE ASSEMBLY, Contacting (Used on RA-346B)	1
		ATTACHING PARTS	
-13	304-0006	. SETSCREW, Fluted soc dr, cup pt, stl, cad. pl, No. 4-40NC-3A thd by 3/32 in. lg (Used on RA-346B)	2
		---*---	
-14	41354	. PLATE ASSEMBLY, Contacting	1
		ATTACHING PARTS	
-15	304-0006	. SETSCREW, Fluted soc dr, cup pt, stl, cad. pl, No. 4-40NC-3A thd by 3/32 in. lg	2
		---*---	
-16	36012-0002	. GEARING UNIT ASSEMBLY (Used on RA-346B) (See Figure 6-4)	1
		ATTACHING PARTS	
-17	29895-4016	. SCREW, Machine, rh, Phillips dr, brs, cad. pl, No. 4-40NC-2A thd by 1/4 in. lg (AN505PB4R4) (Used on RA-346B)	4
		---*---	
-18	29877-0003	. GEARING UNIT ASSEMBLY (See Figure 6-4)	1
		ATTACHING PARTS	
-19	29895-4016	. SCREW, Machine, rh, Phillips dr, brs, cad. pl, No. 4-40NC-2A thd by 1/4 in. lg (AN505PB4R4)	4
		---*---	
-20	36011	. DIAL ASSEMBLY, Control (Used on RA-346B)	1
		ATTACHING PARTS	
-21	322-0008	. SETSCREW, Hexagon soc dr, cup pt, stl, cad. pl, No. 2-56 thd by 1/8 in. lg (AN565DC2H2) (Used on RA-346B)	2
		---*---	
-22	29861	. DIAL ASSEMBLY, Control	1
		ATTACHING PARTS	
-23	322-0008	. SETSCREW, Hexagon soc dr, cup pt, stl, cad. pl, No. 2-56 thd by 1/8 in. lg	2
		---*---	

RA-346A AND RA-346B RECEIVER ACCESSORY PARTS LIST

Figure & Index No.	Part Number	Description 1 2 3 4 5 6	Qty Per Assy
6-3-24	30718-0005	. CONNECTOR, Electrical (02660 part no. 94-65940)	1
		ATTACHING PARTS	
-25	29896-4012	. SCREW, Machine, rh, Phillips dr, brs, cad. pl, No. 4-40 thd by 3/16 in. lg (AN515PB4R3)	6
-26	29898-3004	. WASHER, Lock, split, brz, cad. pl, No. 4 (AN935B4L)	6
		---*---	
-27	32481	. WINDOW (Used on RA-346B)	1
		ATTACHING PARTS	
-28	142-0008	. SCREW, Machine, fh, brs, ni pl, No. 2-56 thd by 1/8 in. lg (Used on RA-346B)	4
		---*---	
-29	32481	. WINDOW	1
		ATTACHING PARTS	
-30	142-0008	. SCREW, Machine, fh, brs, ni pl, No. 2-56 thd by 1/8 in. lg	4
		---*---	
-31	30455-0831	. PLUG, Button	1
-32	31059-0001	. COVER ASSEMBLY	1
-33	22237-0000	. STUD, Snapslide fastener	2
-34	4647-0001	. WASHER, Flat, phosphor brz, cad. pl, 0.140 ID by 0.187 OD, by 0.010 in. thk	AR
-35	24175-9148	. HANDLE, Bow	1
-36	22138-0000	. COLLAR, Shaft	2
		ATTACHING PARTS	
-37	29896-6020	. SCREW, Machine, rh, Phillips dr, brs, cad. pl, No. 6-32 thd by 5/16 in. lg (AN515PB6R5)	2
-38	29898-3006	. WASHER, Lock, split, brz, cad. pl, No. 6 (AN935B6L)	2
		---*---	
-39	41342-0001	. PLATE, Identification (Used on RA-346A)	1
	41342-0002	. PLATE, Identification (Used on RA-346B)	1
		ATTACHING PARTS	
-40	30145-2012	. SCREW, Tapping, thd forming, pan hd, Phillips dr, CRES, No. 2 by 3/16 in. lg	2
		---*---	
-41	22394-0000	. BRACKET, Angle	1
		ATTACHING PARTS	
-42	30454-6020	. SCREW, Machine, rh, Phillips dr, CRES, No. 3-48 thd by 5/16 in. lg	2
-43	29898-3006	. WASHER, Lock, split, brz, cad. pl, No. 6 (AN935B6L)	2
		---*---	
-44	31040-0002	. COVER, Front	1
		ATTACHING PARTS	
-45	30454-3016	. SCREW, Machine, rh, Phillips dr, CRES, No. 3-48 thd by 1/4 in. lg	2
-46	29898-3003	. WASHER, Lock, split, brz, cad. pl, No. 3 (AN935B3L)	2
		---*---	
-47	35874-0001	. CHASSIS ASSEMBLY	1



-346B Receiver Accessory, Exploded View

RA-346A AND RA-346B RECEIVER ACCESSORY PARTS LIST

Figure & Index No.	Part Number	Description 1 2 3 4 5 6	Qty Per Assy
6-3-24	30718-0005	. CONNECTOR, Electrical (02660 part no. 94-65940)	1
		ATTACHING PARTS	
-25	29896-4012	. SCREW, Machine, rh, Phillips dr, brs, cad. pl, No. 4-40 thd by 3/16 in. lg (AN515PB4R3)	6
-26	29898-3004	. WASHER, Lock, split, brz, cad. pl, No. 4 (AN935B4L)	6
		---*---	
-27	32481	. WINDOW (Used on RA-346B)	1
		ATTACHING PARTS	
-28	142-0008	. SCREW, Machine, fh, brs, ni pl, No. 2-56 thd by 1/8 in. lg (Used on RA-346B)	4
		---*---	
-29	32481	. WINDOW	1
		ATTACHING PARTS	
-30	142-0008	. SCREW, Machine, fh, brs, ni pl, No. 2-56 thd by 1/8 in. lg	4
		---*---	
-31	30455-0831	. PLUG, Button	1
-32	31059-0001	. COVER ASSEMBLY	1
-33	22237-0000	. STUD, Snapslide fastener	2
-34	4647-0001	. WASHER, Flat, phosphor brz, cad. pl, 0.140 ID by 0.187 OD, by 0.010 in. thk	AR
-35	24175-9148	. HANDLE, Bow	1
-36	22138-0000	. COLLAR, Shaft	2
		ATTACHING PARTS	
-37	29896-6020	. SCREW, Machine, rh, Phillips dr, brs, cad. pl, No. 6-32 thd by 5/16 in. lg (AN515PB6R5)	2
-38	29898-3006	. WASHER, Lock, split, brz, cad. pl, No. 6 (AN935B6L)	2
		---*---	
-39	41342-0001	. PLATE, Identification (Used on RA-346A)	1
	41342-0002	. PLATE, Identification (Used on RA-346B)	1
		ATTACHING PARTS	
-40	30145-2012	. SCREW, Tapping, thd forming, pan hd, Phillips dr, CRES, No. 2 by 3/16 in. lg	2
		---*---	
-41	22394-0000	. BRACKET, Angle	1
		ATTACHING PARTS	
-42	30454-6020	. SCREW, Machine, rh, Phillips dr, CRES, No. 3-48 thd by 5/16 in. lg	2
-43	29898-3006	. WASHER, Lock, split, brz, cad. pl, No. 6 (AN935B6L)	2
		---*---	
-44	31040-0002	. COVER, Front	1
		ATTACHING PARTS	
-45	30454-3016	. SCREW, Machine, rh, Phillips dr, CRES, No. 3-48 thd by 1/4 in. lg	2
-46	29898-3003	. WASHER, Lock, split, brz, cad. pl, No. 3 (AN935B3L)	2
		---*---	
-47	35874-0001	. CHASSIS ASSEMBLY	1

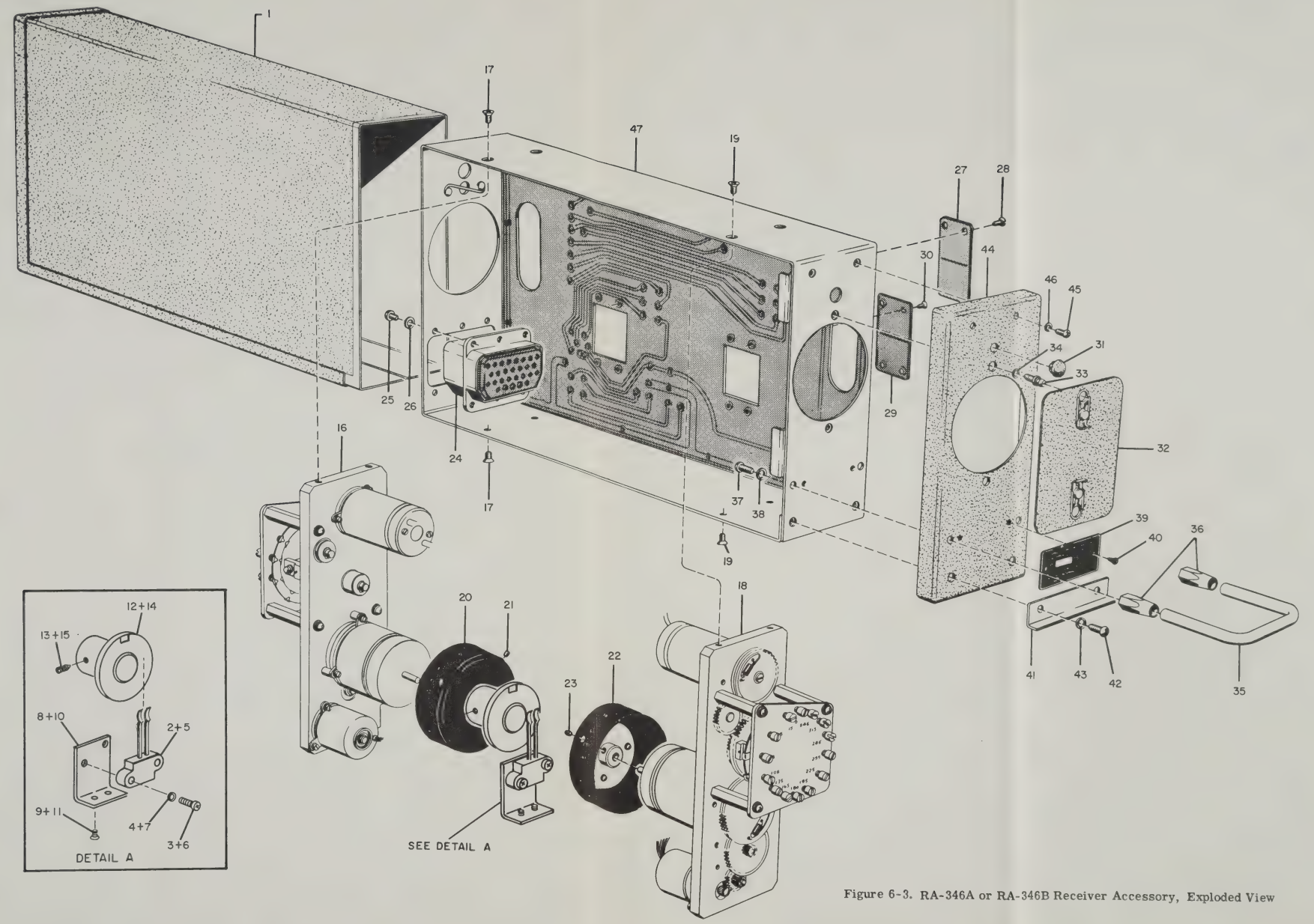


Figure 6-3. RA-346A or RA-346B Receiver Accessory, Exploded View

GEARING UNIT ASSEMBLY, RECEIVER ACCESSORY PARTS LIST

Figure & Index No.	Part Number	Description 1 2 3 4 5 6	Qty Per Assy
6-4 -	36012-0002	GEARING UNIT ASSEMBLY (Used on RA-346B) (See 16, Figure 6-3)	Ref
	29877-0003	GEARING UNIT ASSEMBLY (See 18, Figure 6-3)	Ref
-1	36052	. PLATE ASSEMBLY (Used on Part No. 36012-0002)	1
	30079	. PLATE ASSEMBLY (Used on Part No. 29877-0003)	1
		ATTACHING PARTS	
-2	30454-4020	. SCREW, Machine, rh, Phillips dr, CRES, No. 4-40 thd by 3/8 in. lg (AN515C4R5)	4
-3	29898-3004	. WASHER, Lock, split, brz, cad. pl, No. 4 (AN935B4L)	4
-4	28558-1004	. WASHER, Flat, CRES, No. 4 (AN960C4)	4
		---*---	
-5	30086	. POST	4
		ATTACHING PARTS	
-6	30454-4024	. SCREW, Machine, rh, Phillips dr, CRES, No. 4-40 thd by 3/8 in. lg (AN515C4R6)	4
-7	29898-3004	. WASHER, Lock, split, brz, cad. pl, No. 4 (AN935B4L)	4
-8	28558-1004	. WASHER, Flat, CRES, No. 4 (AN960C4)	4
		---*---	
-9	30087	. GEAR ASSEMBLY	1
		ATTACHING PARTS	
-10	322-4008	. SETSCREW, Hexagon soc dr, cup pt, stl, cad. pl, No. 4-40 thd by 1/8 in. lg (AN565DC4H2)	2
		---*---	
-11	29844	. GEARING ASSEMBLY	1
		ATTACHING PARTS	
-12	28665-0018	. RING, Retaining (79136 Part No. 5100-18-C) (MS16624-18)	1
-13	17765-0001	. SHIM, CRES, 0.190 ID by 0.234 OD by 0.003 in. thk	AR
		---*---	
-14	30996	. . WASHER, Flat, stl, passivate fin., 0.2812 ID by 0.500 OD by 0.062 in. thk	1
-15	30314	. . GEAR, Spur	1
-16	17831	. . SPRING, Helical, extension	1
-17	29852	. . GEAR, Spur	1
-18	30995	. . WASHER, Flat, stl, passivate fin., 0.380 ID by 0.500 OD by 0.040 in. thk	1
-19	29845	. . PIN, Shoulder, headless	1
-20	8775-0442	. . PIN, Spring	1
-21	29857	. . ARM ASSEMBLY	1
		ATTACHING PARTS	
-22	29896-2012	. . SCREW, Machine, rh, brs, cad. pl, No. 2-56 thd by 3/16 in. lg (AN515PB2R3)	1
		---*---	
-23	29848	. . PIN, Grooved, headed	1
		ATTACHING PARTS	
-24	28665-0012	. . RING, Retaining (79136 Part No. 5100-12-C)	2
-25	17768-0000	. . SHIM, Sst, 0.128 ID by 0.187 OD by 0.003 in. thk	1
		---*---	
-26	29849	. . SPRING, Helical, torsion	1
-27	30088	. . GEAR SUBASSEMBLY	1

GEARING UNIT ASSEMBLY, RECEIVER ACCESSORY PARTS LIST

Figure & Index No.	Part Number	Description 1 2 3 4 5 6	Qty Per Assy
6-4-28	18008	. SYNCHRO, Transmitter, 26 V, 400 Hz, 13 V, 100 Hz (88818 Part No. RS911-4A)	1
		ATTACHING PARTS	
-29	29897-3016	. SCREW, Machine, fil h, stl, passivate fin., No. 3-48 thd by 1/4 in. lg (AN500D3-4)	3
-30	29898-3003	. WASHER, Lock, split, brz, cad. pl, No. 3 (AN935B3L)	3
-31	26804-0001	. CLAMP, Rim clenching	3
		---*---	
-32	29854	. GEAR ASSEMBLY	1
		ATTACHING PARTS	
-33	28665-0018	. RING, Retaining (79136 Part No. 5100-18-C) (MS16624-18)	1
-34	17765-0001	. SHIM, CRES, 0.190 ID by 0.234 OD by 0.003 in. thk	AR
		---*---	
-35	31058	. GEAR ASSEMBLY	1
		ATTACHING PARTS	
-36	322-2008	. SETSCREW, Hexagon, soc dr, cup pt, stl, cad. pl, No. 2-56 thd by 1/8 in. lg (AN565DC2H2)	2
		---*---	
-37	39371	. GONIOMETER KIT, Bendix (Consists of Goniometer, Part No. 32043, and 3 each Spacers, Part No. 26805-1003) (alternate for Part No. 39372)	1
	39372	. GONIOMETER KIT, Scot (Consists of Goniometer Part No. 37483-0001, and 3 each Spacers, Part No. 26805-1004) (alternate for Part No. 39371)	1
		ATTACHING PARTS	
-38	29897-3028	. SCREW, Machine, fil h, stl, passivate fin., No. 3-48 thd by 7/16 in. lg (AN500D3-7)	3
-39	29898-3003	. WASHER, Lock, split, brz, cad. pl, No. 3 (AN935B3L)	3
-40	26804-0001	. CLAMP, Rim clenching.	3
		---*---	
-41	31055	. GEAR SUBASSEMBLY	1
		ATTACHING PARTS	
-42	28665-0012	. RING, Retaining (79136 Part No. 5100-12-C) (MS16624-12)	1
-43	17768-0001	. SHIM, CRES, 0.128 ID by 0.187 OD by 0.0003 in. thk	AR
		---*---	
-44	32706	. GEAR SUBASSEMBLY	1
		ATTACHING PARTS	
-45	30323-0009	. RING, Retaining (79136 Part No. 5133-9-MD) (MS16633-1009)	1
		---*---	
-46	40963	. MOTOR, Control	1
		ATTACHING PARTS	
-47	29897-3020	. SCREW, Machine, fil h, stl, passivate fin., No. 3-48 thd by 5/16 in. lg (AN500D3-6)	3
-48	29898-3003	. WASHER, Lock, split, brz, cad. pl, No. 3 (AN935B3L)	3
-49	38409-0002	. CLAMP, Rim clenching	3
-50	7475	. TERMINAL	1
		---*---	
-51	29017	. WASHER, Flat, sst, passivated, 0.516 ID by 0.687 OD by 0.005 in. thk	2
-52	36010	. PLATE ASSEMBLY (Used on part no. 36012-0002)	1
	31052-0001	. PLATE ASSEMBLY (Used on part no. 29877-0003)	1

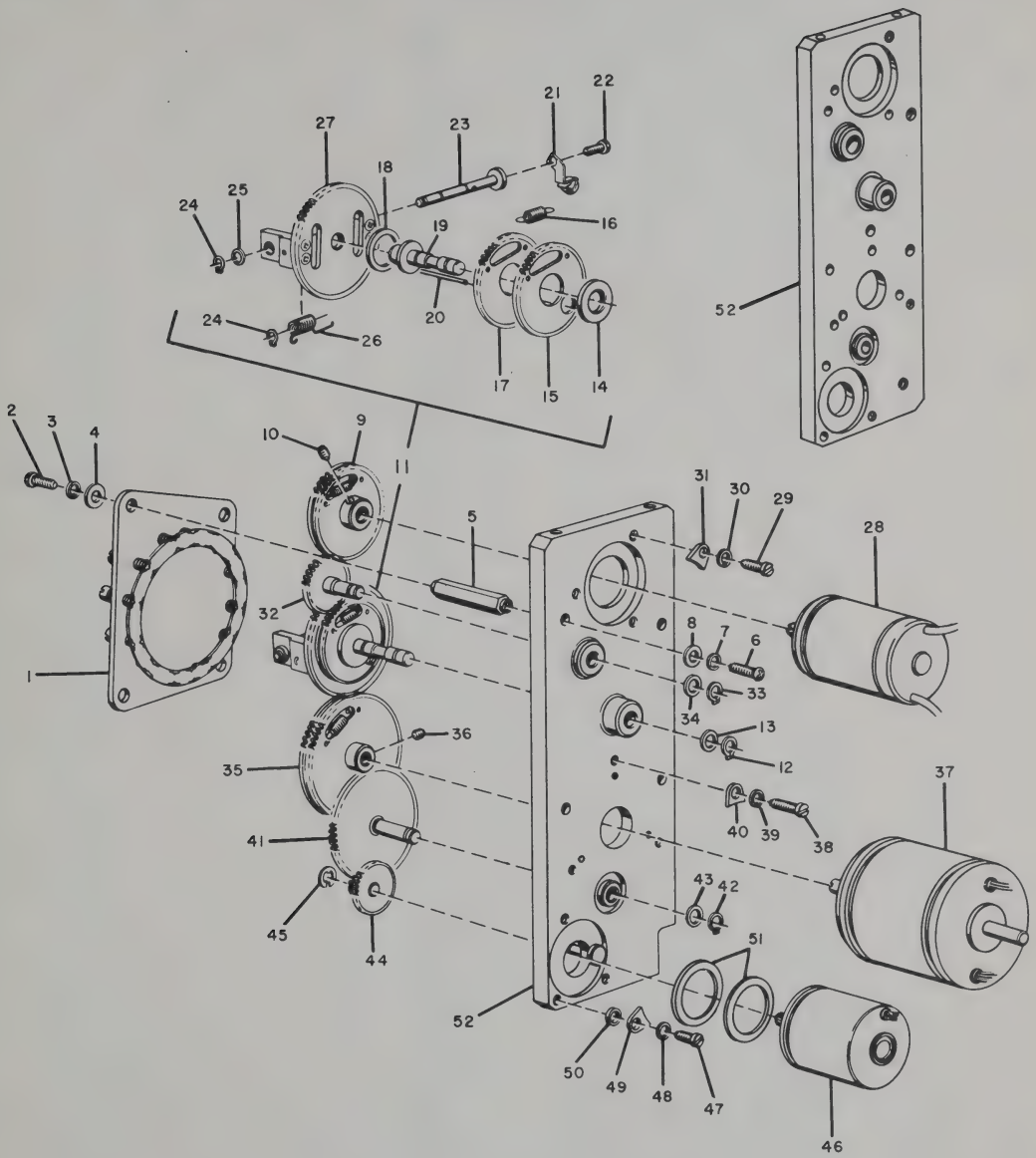


Figure 6-4. Receiver Accessory, Gearing Unit Assembly, Exploded View

PART NUMBER	FIG. & INDEX NO.
	6-1 -33
	6-1 -35
	6-1 -36
	6-1 -48
	6-1 -49
	6-1 -51
	6-1 -52
	6-1 -69
	6-1 -109
	6-1 -111
	6-1 -112
	6-1 -166
	6-2 -4A
	6-2 -4B
102-0012	6-2 -104
102-0016	6-1 -44
102-0028	6-3 -3
102-0028	6-3 -6
102-0032	6-2 -55
104-0016	6-1 -4
104-0016	6-1 -61
104-0020	6-2 -48
104-0024	6-2 -49
104-0040	6-2 -18
113-0024	6-1 -18
11816	6-2 -32
13046	6-1 -73
13046	6-1 -139
13046	6-1 -159
13473	6-1 -19
142-0008	6-3 -28
142-0008	6-3 -30
142-0012	6-3 -9
142-0012	6-3 -11
142-0016	6-2 -43
144-0012	6-1 -38
144-0016	6-2 -14
14562	6-1 -23
14591	6-2 -76
14680	6-1 -25
15155	6-1 -57
152-0012	6-2 -40
154-0016	6-1 -31
163-0020	6-2 -78
163-0020	6-2 -88
163-0024	6-2 -83
164-0024	6-1 -54
174-0028	6-2 -30
17400	6-1 -77
17758-0000	6-2 -53
17765-0001	6-4 -13
17765-0001	6-4 -34
17768-0000	6-4 -25
17768-0000	6-1 -82
17768-0000	6-1 -85
17768-0000	6-1 -88
17768-0000	6-1 -91
17768-0000	6-1 -98
17768-0000	6-1 -105
17768-0000	6-1 -115
17768-0000	6-1 -123
17768-0000	6-1 -126
17768-0000	6-1 -129
17768-0000	6-1 -132
17768-0000	6-1 -146
17768-0000	6-2 -107
17768-0001	6-4 -43
17831	6-4 -16
17831	6-2 -113
18008	6-4 -28
18008	6-2 -87
20097-0134	6-2 -25
20249	6-2 -33
20250	6-2 -35
20261	6-2 -37
21623	6-2 -102
22138-0000	6-3 -36
22237-0000	6-3 -33
22341	6-1 -56
22341	6-1 -62
22341	6-1 -65
22341	6-1 -72
22341	6-1 -138
22341	6-1 -152
22341	6-1 -158
22394-0000	6-3 -41
24175-9148	6-3 -35
2544	6-1 -153
26050	6-2 -34
26633-0001	6-1 -40
26633-0011	6-1 -39
26804-0000	6-2 -85
26804-0000	6-2 -91
26804-0001	6-4 -31
26804-0001	6-4 -40
26805-0002	6-2 -92
26805-0004	6-2 -86
27029	6-1 -30
27790	6-1 -86
27790	6-1 -99
28476-0012	6-1 -12
28476-0012	6-1 -97
28476-0012	6-1 -104
28476-0012	6-1 -114
28476-0012	6-1 -122
28476-0012	6-1 -128
28476-0018	6-1 -74
28476-0018	6-1 -140
28476-0018	6-1 -160
28558-1004	6-4 -4
28558-1004	6-4 -8
28665-0012	6-4 -24
28665-0012	6-4 -42
28665-0012	6-1 -81
28665-0012	6-2 -52
28665-0012	6-2 -106
28665-0018	6-4 -12
28665-0018	6-4 -33
28665-0018	6-2 -63
28665-0018	6-2 -120
28665-0025	6-2 -101
29017	6-4 -51
29519	6-2 -31
29609-0026	6-2 -20
29844	6-4 -11
29845	6-4 -19
29848	6-4 -23
29848	6-2 -105
29849	6-4 -26
29849	6-2 -108
29852	6-4 -17
29852	6-2 -114
29854	6-4 -32
29857	6-4 -21
29857	6-2 -103
29861	6-3 -22
29877-0003	6-3 -18
29877-0003	6-4 -0
29895-4016	6-3 -17
29895-4016	6-3 -19
29896-2012	6-4 -22
29896-4012	6-3 -25
29896-6020	6-3 -37
29897-3016	6-4 -29
29897-3020	6-4 -47
29897-3028	6-4 -38
29898-3003	6-3 -46
29898-3003	6-4 -30
29898-3003	6-4 -39
29898-3003	6-4 -48
29898-3004	6-3 -26
29898-3004	6-4 -3
29898-3004	6-4 -7
29898-3006	6-3 -38
29898-3006	6-3 -43
29916-0001	6-1 -59
29916-0001	6-2 -7
30079	6-4 -1
30086	6-4 -5
30087	6-4 -9
30087	6-2 -74
30088	6-4 -27
30145-2012	6-3 -40
302-0006	6-1 -90
302-0006	6-1 -95
302-0006	6-1 -117
302-0006	6-1 -143
302-0006	6-2 -65
302-0006	6-2 -70
302-0006	6-2 -95
302-0006	6-2 -97
30314	6-4 -15
30314	6-2 -115
30323-0009	6-4 -45
304-0006	6-3 -13
304-0006	6-3 -15
304-0006	6-1 -84
304-0006	6-1 -93
304-0006	6-1 -102
304-0006	6-1 -119
304-0006	6-1 -148
304-0006	6-2 -67
304-0006	6-2 -75
304-0008	6-1 -67
304-0008	6-1 -87
304-0008	6-1 -100
304-0008	6-1 -107
304-0008	6-1 -164
30454-3016	6-3 -45
30454-4020	6-4 -2
30454-4024	6-4 -6
30454-6020	6-3 -42
30455-0831	6-3 -31
30718-0005	6-3 -24
30995	6-4 -18
30995	6-2 -112
30996	6-4 -14
30996	6-2 -116
31040-0002	6-3 -44
31052-0001	6-4 -52
31055	6-4 -41
31058	6-4 -35
31059-0001	6-3 -32
31169-0000	6-2 -10

PART NUMBER	FIG. & INDEX NO.	PART NUMBER	FIG. & INDEX NO.	PART NUMBER	FIG. & INDEX NO.
322-0008	6-3 -21	36010	6-4 -52	41762	6-1 -68
322-0008	6-3 -23	36011	6-3 -20	41763	6-1 -108
322-2008	6-4 -36	36012-0002	6-3 -16	41763	6-1 -165
322-4008	6-4 -10	36012-0002	6-4 -0	41764-0032	6-1 -7
3228	6-2 -118	36052	6-4 -1	41764-0032	6-1 -10
324-4008	6-1 -6	36183-0002	6-1 -27	41765-0000	6-1 -8
324-4008	6-1 -16	37483-0001	6-2 -82	41765-0001	6-1 -13
324-4012	6-1 -9	38409-0002	6-4 -49	41768	6-1 -131
324-4012	6-1 -11	38409-0002	6-2 -80	41773	6-1 -125
324-4012	6-1 -14	3873	6-2 -59	41774	6-1 -135
32481	6-3 -27	39013-2182	6-2 -60	41775-0000	6-1 -63
32481	6-3 -29	39021-0002	6-2 -41	41775-0001	6-1 -167
3276	6-4 -44	39090	6-2 -61	41775-0001	6-1 -171
32905-0000	6-1 -22	39091	6-2 -57	41775-0002	6-1 -172
32935-0000	6-1 -32	39371	6-4 -37	41778	6-1 -155
32971-0003	6-1 -28	39372	6-4 -37	41778	6-1 -170
33076	6-2 -29	40178-0004	6-1 -110	41783	6-1 -177
33083	6-2 -45	40220	6-1 -0	41784-0000	6-1 -21
33084-0002	6-2 -47	40222-0001	6-1 -1	41833	6-1 -29
33089	6-2 -51	40248-1213	6-1 -42	41938	6-1 -3
33093	6-2 -68	40764	6-2 -34	41939	6-1 -175
33094	6-2 -98	40956-0000	6-1 -134	41948	6-1 -121
33127	6-2 -72	40956-0001	6-1 -130	41949	6-1 -127
33129	6-2 -71	40963	6-4 -46	42037-0001	6-1 -17
33138-0055	6-1 -113	40963	6-2 -77	42038	6-1 -20
33138-0055	6-1 -154	41291	6-2 -13	42039	6-1 -15
33138-0055	6-1 -169	41302	6-3 -2	42045	6-1 -26
33138-0055	6-1 -174	41302	6-3 -5	42046	6-1 -37
33138-0115	6-1 -176	41302	6-2 -54	42047	6-1 -173
33148	6-2 -69	41303	6-2 -66	42048	6-1 -101
33152	6-2 -96	41306-0000	6-2 -46	42048	6-1 -147
33165	6-1 -80	41306-0001	6-2 -46	42049	6-1 -145
33192	6-1 -76	41340-0001	6-3 -0	42050	6-1 -94
33205	6-2 -100	41340-0002	6-3 -0	42050	6-1 -142
33207	6-2 -111	41342-0001	6-3 -39	42051	6-1 -168
33224	6-2 -119	41342-0002	6-3 -39	42052	6-1 -150
33227	6-2 -94	41347-0001	6-2 -1	42053	6-1 -60
33228	6-2 -27	41353	6-3 -8	42054	6-1 -162
33243	6-2 -99	41353	6-3 -10	42055	6-1 -144
33245-0001	6-2 -23	41354	6-3 -12	42073	6-1 -92
33248	6-2 -109	41354	6-3 -14	42074	6-1 -83
3327	6-2 -2	41360-1000	6-2 -0	42282	6-1 -120
33270	6-2 -64	41360-1001	6-2 -0	4386	6-3 -4
33273	6-2 -21	41360-1100	6-2 -0	4386	6-3 -7
33281-0001	6-2 -16	41360-1101	6-2 -0	4386	6-1 -45
33489-0002	6-2 -93	41361-1000	6-2 -12	4386	6-2 -56
33533-0001	6-2 -122	41361-1001	6-2 -12	4558	6-1 -79
33694	6-2 -73	41361-1100	6-2 -12	4559	6-2 -79
34140-0002	6-2 -39	41361-1101	6-2 -12	4559	6-2 -84
34140-0003	6-2 -39	41629	6-1 -5	4559	6-2 -89
34144	6-2 -44	41726	6-1 -116	4561	6-1 -78
34147-0002	6-2 -36	41727	6-1 -118	4644	6-2 -81
34147-0003	6-2 -36	41728	6-1 -66	4647-0001	6-3 -34
34153	6-2 -38	41728	6-1 -106	4664	6-2 -90
34155	6-2 -50	41728	6-1 -163	50184-0007	6-1 -43
34614-1102	6-1 -41	41729	6-1 -133	502-0008	6-2 -110
35156-0002	6-2 -42	41733	6-1 -124	502-0012	6-2 -58
35860-0118	6-2 -4	41737	6-1 -89	502-0016	6-2 -28
35860-0134	6-1 -53	41745	6-1 -70	504-0016	6-2 -22
35861-0118	6-2 -9	41745	6-1 -136	504-0016	6-2 -24
35861-0122	6-1 -58	41745	6-1 -156	504-0016	6-2 -26
35861-0122	6-2 -8	41746	6-1 -75	504-0024	6-2 -11
35862-0001	6-1 -50	41746	6-1 -141	504-0040	6-2 -17
35862-0001	6-2 -6	41746	6-1 -161	514-0016	6-2 -3
35862-0002	6-1 -47	41747	6-1 -96	7117-0000	6-2 -62
35862-0002	6-2 -5	41748	6-1 -149	7117-0000	6-2 -121
35874-0001	6-3 -47	41749	6-1 -103	7475	6-4 -50
35876-0001	6-3 -1	41761	6-1 -34	8040	6-1 -24

PART NUMBER	FIG. & INDEX NO.	PART NUMBER	FIG. & INDEX NO.	PART NUMBER	FIG. & INDEX NO.
8040	6-1 -55				
8040	6-1 -64				
8040	6-1 -71				
8040	6-1 -137				
8040	6-1 -151				
8040	6-1 -157				
8275	6-1 -46				
8775-0016	6-2 -15				
8775-0442	6-4 -20				
8775-0442	6-2 -117				
8927-0004	6-2 -19				
8956-2010	6-1 -2				

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